Saskatchewan
Agriculture
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AGRICULTURE DEVELOPMENT FUND

FINAL REPORT

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INTEGRATED WEED MANAGEMENT

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Integrated Weed Management
Final Report

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and Food

Integrated Weed Management

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3. Bowes, G. 2005. Invasive Plants are a Rural-Urban Problem. Rural Councillor. August/September Vol. 40 (4) 25 - 26. 3
4. Bowes, G. 2005. Leafy Spurge Control with Flea Beetles, Sheep and Herbicides. Rural Councillor. October/November Vol. 40 (5) 19 - 20. 5
5. Bowes, G. 2005. Weed Seed Viability in Manure, Silage and Compost. Rural Councillor. December 2005/January 2006 Vol. 40 (6), 18 - 19. 7
6. Bowes, G. 2006. Leafy Spurge Disappears at Maxim. Rural Councillor. February/March Vol. 41 (1), 00 - 00. (In press)

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4. Bowes, G. 2005. Weed Management Areas and The Noxious Weed Program. Livestock Development Branch Meeting April 25, 2005 in Saskatoon 12
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Integrated Weed Management

(a) Summary

Biocontrol agents for leafy spurge and scentless chamomile are an important part of an integrated weed control program. The agents are the scentless chamomile seed weevils (*Omphalapion hookeri*) and gall midges (*Rhopalomyia tripleurospermi*), and leafy spurge flea beetles (*Aphthona cyparissiae, A. nigriscutis and A.* lacertosa). Seed weevils and gall midges move around on their own and should be released on 'safe sites'. Beetles need help to move from an established site to new sites. Use beetles to control large areas with leafy spurge that are contained by a herbicide. Details were delivered on how to use integrated weed control to stop these weeds from spreading along roadsides.

(b) Technical Report

Objectives

- to collect data and document the success of biocontrol agents released in Saskatchewan by evaluating:
    - existing colonies of biocontrol agents released for the control of persistent perennial weeds, including scentless chamomile and leafy spurge,
    - the long-term benefit of integrating biological control agents with existing control options such as herbicides for scentless chamomile and leafy spurge,
    - existing biocontrol release sites on scentless chamomile to determine the 'best fit' for biocontrol when integrated with mechanical and herbicide control methods, and
    - to develop and implement provincial **awareness** for the use of biocontrol agents in an integrated control program to **stop** the spread of scentless chamomile, leafy spurge and other perennial weeds.

- to ensure that Saskatchewan has access to new biocontrol related technology including classical, inundative and molecular agents and products and to evaluate and release additional biocontrol agents as they become available.

MILESTONES

BIOCONTROL - Persistent Perennial Weeds & Scentless Chamomile Program Awareness

1. Prepare progress report

Monthly progress reports were prepared. These reports outlined the activities that were completed each month.

Outputs that deliver information on the activities referred to in the progress reports are presented in Appendixes 1 to 4. This information was organized into:

- print articles in the Rural Councillor (Appendix 1, pages 1 - 8);
- information presented in booths at SARM events and training clinics for Weed Inspectors (Appendix 2, pages 1 - 78);
- PowerPoint presentations to landowners, Reeves, Councillors and Weed Inspectors (Appendix 3, pages 1 - 15); and
- Biological control agent monitoring reports (Appendix 4, pages 1 - 168).

2. Schedule of biocontrol site inspections

The schedules for selecting sites to monitor during 2005 were selected from the 2004 Saskatchewan U-Pick Leafy Spurge Flea Beetle Information Guide and the 2004 Scentless Chamomile Biological Control Agent Information Guide. The updated versions of the reports are presented in Appendix 4 (2006 Saskatchewan U-Pick Leafy Spurge Flea Beetle Information Guide, pages 1 – 108 and the 2006 Scentless Chamomile Biological Control Agent Information Guide, pages 109 – 168).

The purpose for monitoring release sites is three-fold; a) to determine if biocontrol agents establish and increase, b) to identify future collection sites and c) to judge agent performance. Sites selected for monitoring leafy spurge flea beetles were those that were thought to have the best potential for agent collection and evaluating agent performance. For the scentless chamomile seed weevil the purpose for monitoring was to find agent collection sites. For scentless chamomile gall midge the purpose was agent establishment and increase.

3. Conduct biocontrol site inspections

During the summer of 2005, 106 leafy spurge flea beetle (*Aphthona cyparissiae, A. nigriscutis and A. lacertosa*), 26 scentless chamomile seed weevil (*Omphalapion hookeri*) and 32 scentless chamomile gall midge (*Rhopalomyia tripleurospermi*) release sites were monitored.

The total number of sites monitored during 2005 was 164.

4. Establish mother colonies of new biocontrol agents

Maxim has been the best site in the province to collect leafy spurge flea beetles. During 2005, the site was monitored in early July and found to be suitable for collection. This information was passed on to those waiting and wanting to collect. On July 12, a group from Moose Jaw collected 65,000 flea beetles. On July 13, a field day was held at Maxim and 35,000 flea beetles were collected.

During 2005, collection sites at Besant and Last Mountain House were suitable for collecting for a few release sites. The size of the area suitable for agent collection at the sites was small and the number of flea beetles per sweep was lower than at the Maxim site. The number of flea beetles collected at Besant and Last Mountain House for release is unknown.

Scentless chamomile weed weevils were collected in the field and shipped to clients. Using the June Collection Method, 30 adult weevils were brushed off flower buds into 60 dm pill containers (Bowes, G. 2004d). The best time to collect weevils from scentless chamomile plants is when the flower bud starts to open, just before the white petals appear. When the population of adult seed weevils on the scentless chamomile plants are high, the June Collection Method is the best method to collect the biocontrol agent.

After seed weevils are brushed into a pill container they first play dead and then try to escape. Seed weevils are easy to collect when 30 adults can be brushed into a pill bottle before there is an attempted escape.

During 2005, a sufficient number of adult seed weevils (60/release site) were collected and shipped for 17 new release sites.

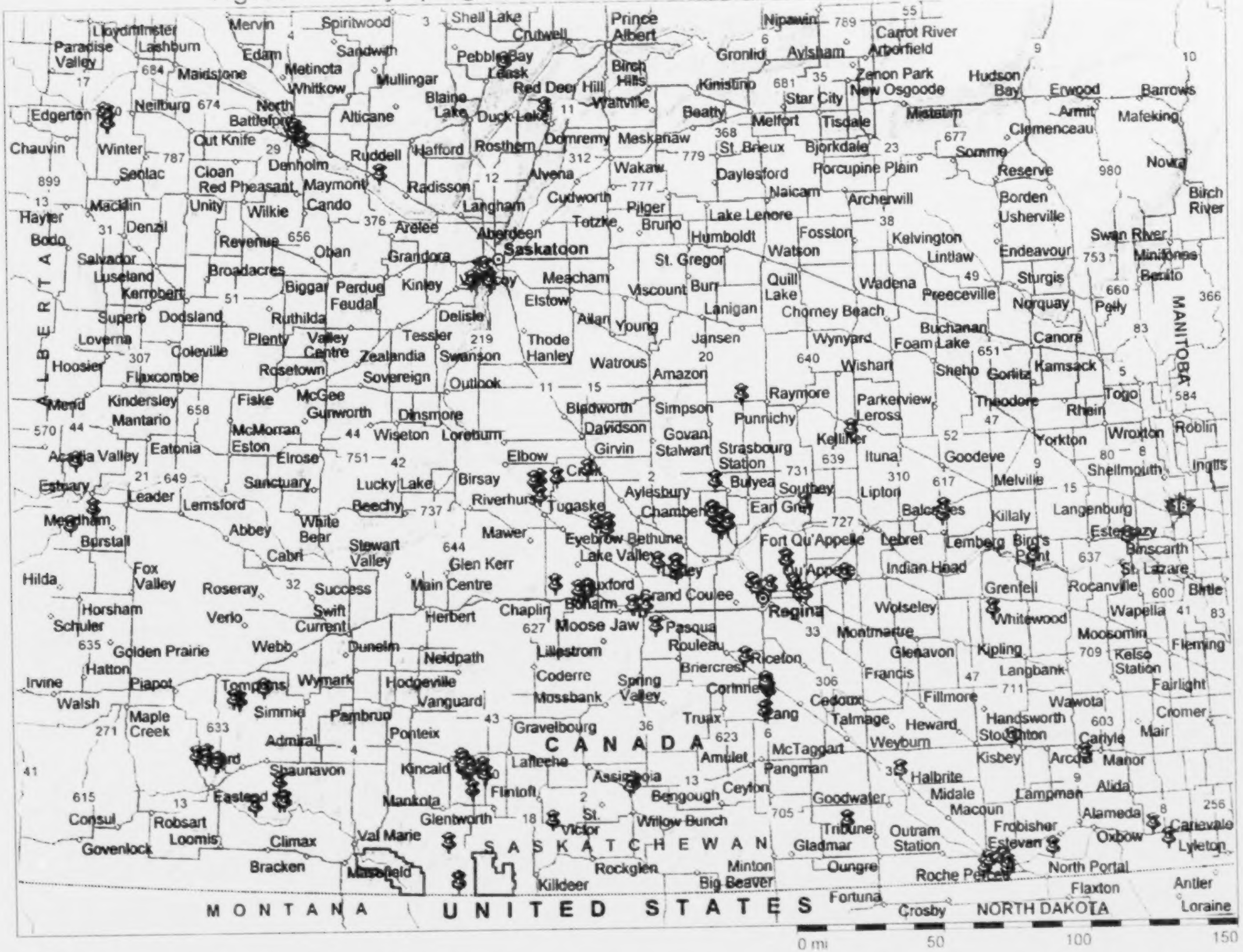
5. Consultative services to rural municipalities

Information was sent to rural municipalities in response to requests.

An information transfer system to locate a known biocontrol agent release site was developed for any municipal official or ratepayer in a municipality. An inexpensive software program, Streets & Trips© by Microsoft Corporation, was adapted to identity release sites in the province. All of the known biocontrol release sites for the flea beetles (leafy spurge), gall midge (scentless chamomile) and seed weevil (scentless chamomile) were mapped using Streets & Trips (Figure 1, 2 and 3). For each pushpin on these maps, the Show Information function for Streets & Trips contained the following information: release code with date, GPS waypoint, latitude, longitude, legal location, rural municipality number, year the release site was last monitored, number of biocontrol agents recorded during monitoring and the contact person. Figure 4 shows a print of a site near Craik. Similar maps were sent to anyone requesting information on the location of release sites.

Information Booths detailing how to stop the spread of leafy spurge and scentless chamomile were set up and manned at events that Reeves, Councillors and Weed Inspectors attend. An example of an Information Booth is shown in Figure 5. Information Booths were manned at the following events: WITCs (Weed Inspector Training Clinics) 2005, SARM (Saskatchewan Association of Rural Municipalities)

Figure 1 Leafy spurge flea beetle release sites in Saskatchewan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Macklin
Unity
Wilkie
Hayter
Bodo
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Luseland
Kerrobert
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Loverna
Coleville
Hoosier
Flaxcombe
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Eatonia
Acadia Valley
Estuary
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Lemsford
Mendham
Burstall
Hilda
Fox Valley
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Alticane
Ruddell
Hafford
Maymont
Cando
Radisson
Revenue
Oban
Arelee
Broadacres
Biggar
Perdue
Feudal
Kinley
Ruthilda
Plenty
Valley Centre
Tessier
Zealandia
Rosetown
Sovereign
Fiske
McGee
Gunworth
McMorran
Eston
Elrose
Wiseton
Dinsmore
Loreburn
Sanctuary
Lucky Lake
Beechy
Abbey
White Bear
Cabri
Stewart Valley
Roseray
Success
Swift Current
Verlo
Webb
Tompkins
Simmie
Wymark
Admiral
Shaunavon
Eastend
Climax
Bracken
Val Marie
Mankota
Kincaid
Glentworth
Killdeer
Shell Lake
Crutwell
Pebble Bay
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Duck Lake
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Langham
Aberdeen
Saskatoon
Delisle
Swanson
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Tugaske
Mawer
Glen Kerr
Main Centre
Herbert
Chaplin
Neidpath
Hodgeville
Vanguard
Pambrun
Ponteix
Dunelm
Laflèche
Flintoft
Gravelbourg
Mossbank
Coderre
Lillestrom
Moose Jaw
Bushell Park
Buxford
Boharm
Eyebrow
Bethune
Lake Valley
Craik
Prince Albert
Birch Hills
Red Deer Hill
Wakaw
Domremy
Alvena
Cudworth
Meskanaw
Pilger
Bruno
Totzke
Humboldt
St. Gregor
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Stalwart
Aylesbury
Chamberlain
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Grand Coulee
Regina
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Rouleau
Briercrest
Riceton
Corinne
Lang
Spring Valley
Truax
Amulet
Assiniboia
Bengough
Willow Bunch
St. Victor
Rockglen
Big Beaver
Minton
Ceylon
Pangman
McTaggart
Goodwater
Tribune
Gladmar
Oungre
Fortuna
Nipawin
Carrot River
Arborfield
Aylsham
Gronlid
Kinistino
Star City
Zenon Park
Beatty
Melfort
Tisdale
St. Brieux
Bjorkdale
Daylesford
Porcupine Plain
Naicam
Archerwill
Lake Lenore
Fosston
Watson
Quill Lake
Wadena
Kelvington
Lintlaw
Chorney Beach
Wynyard
Wishart
Foam Lake
Raymore
Punnichy
Parkerview
Leross
Kelliher
Strasbourg
Bulyea
Earl Grey
Southey
Ituna
Lipton
Fort Qu'Appelle
Qu'Appelle
Balcarres
Lebret
Indian Head
Wolseley
Montmartre
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Francis
Cedoux
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Fillmore
Halbrite
Midale
Macoun
Outram Station
Estevan
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Clemenceau
Somme
Reserve
Borden
Usherville
Endeavour
Sturgis
Preeceville
Norquay
Canora
Buchanan
Sheho
Gorlitz
Kamsack
Theodore
Yorkton
Goodeve
Melville
Killaly
Lemberg
Grenfell
Whitewood
Kipling
Langbank
Handsworth
Stoughton
Kisbey
Arcola
Carlyle
Wawota
Lampman
Frobisher
Alameda
Oxbow
North Portal
Flaxton
Barrows
Mafeking
Novra
Birch River
Swan River
Minitonas
Benito
Pelly
Togo
Rhein
Wroxton
Roblin
Shellmouth
Inglis
Langenburg
Esterhazy
Binscarth
Bird's Point
St. Lazare
Rocanville
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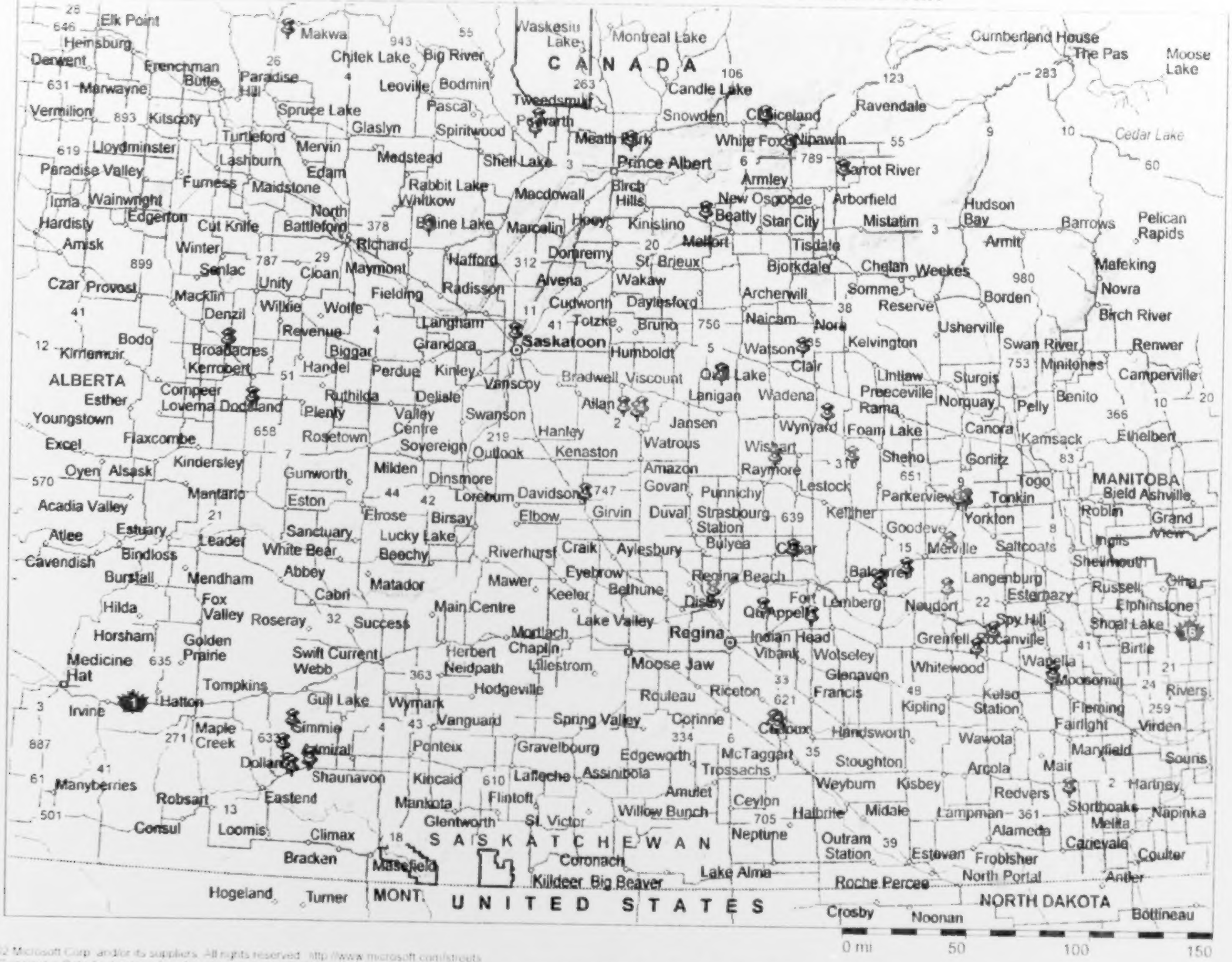
Figure 2 Gall midge release sites in Saskatchewan



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Medicine Hat
Lloydminster
North Battleford
Yorkton
Melfort
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Nipawin
Humboldt
Kindersley
Maple Creek
Weyburn
Estevan
Moosomin
Makwa
Meath Park
Paradise Hill
Blaine Lake
Broadacres
Dodsland
Allan
Quill Lake
Watson
Wishart
Balcarres
Qu'Appelle
Disley
Rocanville
Ceylon
Carrot River
Beatty
Shaunavon
Admiral
Simmie
Dollard
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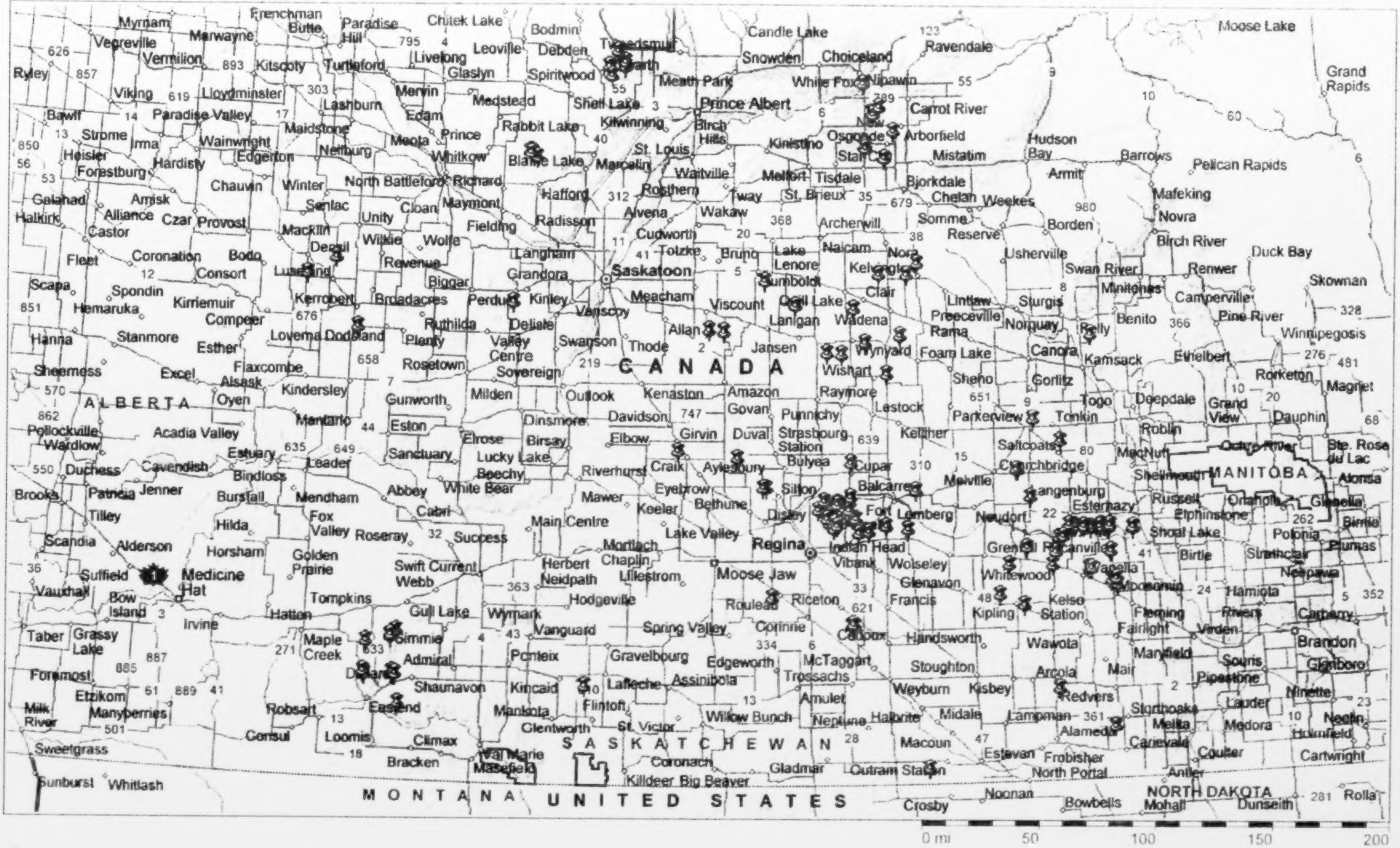
Figure 3 Seed weevil release sites in Saskatchewan



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Lloydminster
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Melfort
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Nipawin
Humboldt
Yorkton
Melville
Indian Head
Fort Qu'Appelle
Weyburn
Estevan
Maple Creek
Shaunavon
Eastend
Kindersley
Rosetown
Outlook
Lanigan
Wadena
Wynyard
Foam Lake
Canora
Kamsack
Esterhazy
Whitewood
Kipling
Redvers
Carnduff
Brandon
Dauphin
Swan River
Hudson Bay
Tweedsmuir
Spiritwood
Shell Lake
Blaine Lake
Unity
Luseland
Kerrobert
Dodsland
Allan
Strasbourg
Cupar
Balcarres
Lemberg
Grenfell
Broadview
Wapella
Moosomin
Alameda
Ceylon
Kelvington
Naicam
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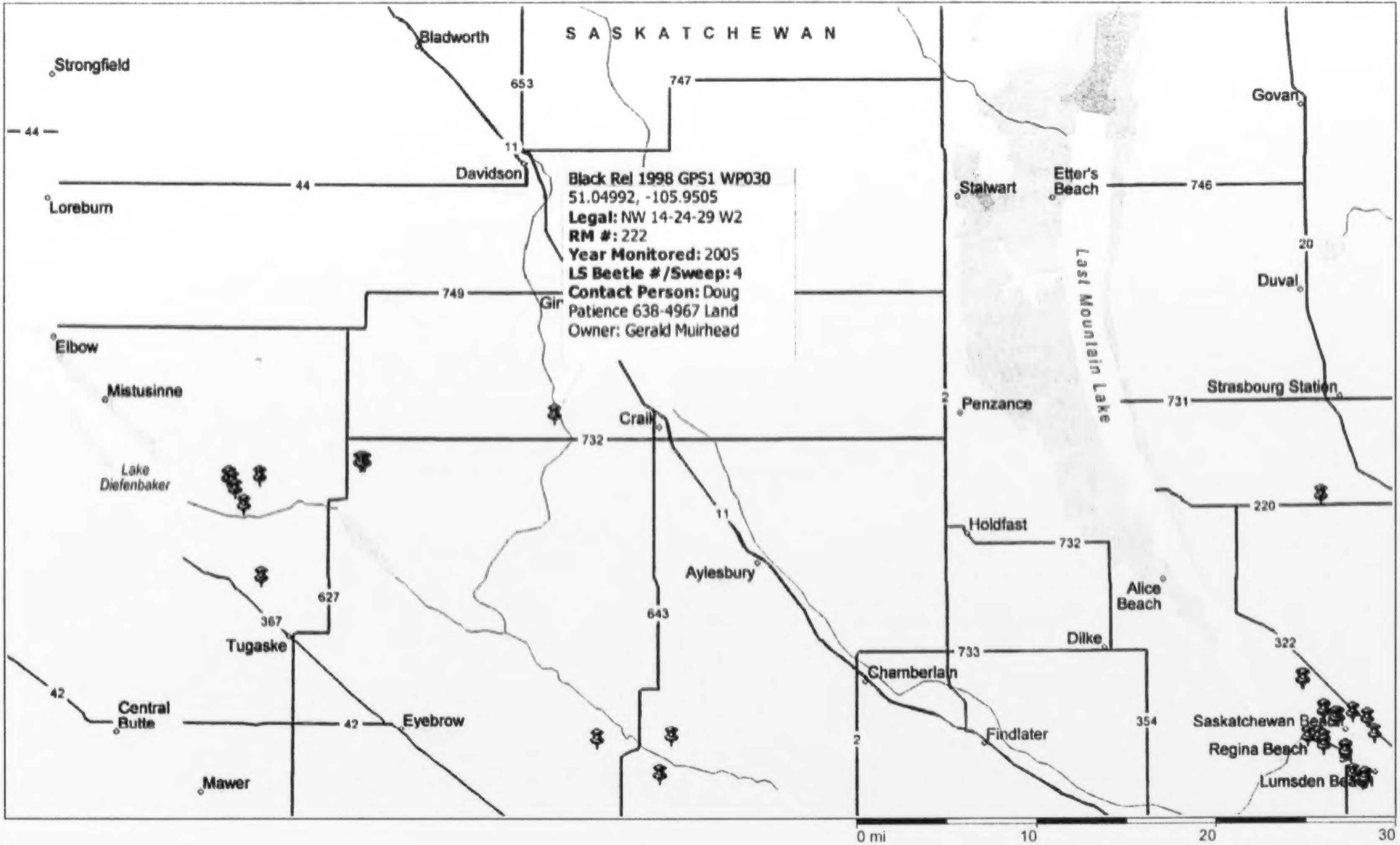
Figure 4 Example of information sent to clients for locating a release site


SASKATCHEWAN
Bladworth
Strongfield
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747
Govan
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11
Davidson
Loreburn
Stalwart
Etter's Beach
746
20
Last Mountain Lake
Duval
749
Gir
Elbow
Mistusinne
Penzance
731
Strasbourg Station
Craik
732
2
Lake Diefenbaker
220
Holdfast
732
11
Aylesbury
Alice Beach
627
643
367
Tugaske
Dilke
322
733
Chamberlain
42
Central Butte
42
Eyebrow
Findlater
354
Saskatchewan Beach
Regina Beach
Lumsden Beach
Mawer
2
0 mi
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20
30

Black Rel 1998 GPS1 WP030
51.04992, -105.9505
Legal: NW 14-24-29 W2
RM #: 222
Year Monitored: 2005
LS Beetle #/Sweep: 4
Contact Person: Doug Patience 638-4967 Land Owner: Gerald Muirhead

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Figure 5 Example of an Information Booth at SARM functions

District Meetings 2005, SARM Midterm Convention 2005, and SARM Convention 2006. The Information Booths were re-designed and contained new information for each SARM event. The Information Booths set up at the WITCs contained the same information that was presented at SARM events.

The Information Booths were well attended and there were many inquiries about stopping weed spread and controlling weeds. Questions were answered and the answers were supported by reprints of Rural Councillor articles and technical articles. CDs-ROM (compact disk – read only memory) of past activities of the Noxious Weed Program were given out and are very popular. A CD-ROM contains 519 pages of information under the following chapters: 1 Rural Councillor Articles, 2 Information Booths at Conventions, 3 Field Day Handouts, 4 PowerPoint Presentations, 5 Maps, 6 Slide Libraries, 7 Technical Articles, 8 Posters, 9 On-Line Biological Control Articles and 10 articles from other authors on Scentless Chamomile and Leafy Spurge.

The best time to stop weed spread is when a new weed first arrives in the province or in an area. Hoary alyssum is found in a few locations in Saskatchewan. Following a request from Daryl Goodfellow, Weed Inspector for the Rural Municipality of Manitou Lake #442, the extent of the hoary alyssum spread was evaluated. Mr. Goodfellow mapped the known areas infested with the weed, and at the same time mapped the spread of leafy spurge on municipal roads and adjacent land. Information was provided on preventing weed spread. Mapping did not include the Artland Co-op Pasture, the Manitou Community Pasture and Yonkers Community Pasture.

6. Monitor biocontrol sites for the 'best fit' of agents

For large tracts of land that are covered with leafy spurge, flea beetles should be captured from known collection sites and released on the weed. According to research conducted by Rodney Lym in North Dakota, the black dot spurge flea beetles (*A. nigriscutis*) reduced the density of leafy spurge 65% whereas the black spurge flea beetles (*A. lacertosa*) reduced the density of leafy spurge 95^{+}% (Lym and Nelson 2000). Black dot beetles should be released on sandy soil and black beetles should be released on clay soils. It is generally thought that the flea beetles work better in warmer southern North Dakota than in cooler Saskatchewan. Further information on leafy spurge and flea beetles can be found in the following articles that were produced through the Noxious Weed Program.

- Bowes, G. 2004a. Leafy Spurge Control, 9pp, available on the Noxious Weed Program CD-ROM
- Bowes, G. 2004b. Where, When and How to Collect and Release Leafy Spurge Flea Beetles, 6pp, available on the Noxious Weed Program CD-ROM

While the scentless chamomile seed weevils consume a portion of the seed that is produced by the weed, most of the seed is available to help the weed spread to new locations. Therefore, the best use of the weevils is with other control methods. Weevils should be released at a secure location on sites where scentless chamomile grows over a large area. The area around the secure location should be controlled by herbicides or mowed. Herbicides are preferred. The weevils will find scentless chamomile plants that are missed by a herbicide or mowing treatment. According to research by the Alberta Research Council at Vegreville, AB, seed weevils can travel 2.7 km/year (McClay 2003). One seed weevil in the larvae stage will eat 11 florets-immature seeds in a flower-seed head of scentless chamomile (McClay and De Clerck-Floate 1999). Based on a sample of one plant, seed weevils consumed 40% of the seed produced by the plant (Bowes 2002). When small patches of scentless chamomile are found, the best treatment is the repeated use of a herbicide as required to control the weed. Following the first herbicide treatment, the site should be monitored for the presence of leafy spurge for at least 8 years.

The best fit for gall midges is unknown but most likely is similar to how seed weevils are used in integrated weed control. According to research by the Alberta Research Council at Vegreville, gall midges can travel 5.2 km/year (McClay 2003). Gall midges should not be released on small patches of scentless chamomile because the weed will produce seed which will help it to spread to new sites. Herbicides are the best choice for the control and potential eradication of small patches of scentless chamomile. Following the first herbicide treatment, the site should be monitored for the presence of scentless chamomile for at least 10 years.

Gall midges are often released at the edge of a slough, along a fence line or in the corner of a field. Gall midge populations do not increase to large numbers because on-going farming practices and right-of-way mowing continually kill scentless chamomile plants with galls. At some release sites, populations of scentless chamomile disappear because of competitive perennial grasses. Gall midges should be released on 'safe sites' where scentless chamomile can be expected to grow, unharmed, for at least 5 years.

Monitoring method for leafy spurge flea beetles

A site selected for monitoring beetles was visited when the adult beetles were feeding on the foliage of leafy spurge. Usually feeding starts during the first week of July and continues into early August. Selected sites were located by a Global Position System (GPS) navigation receiver. The error for a release site was thought to be ± 3 m. Most often the stake marking the release is missing. The stand of leafy spurge is often highly variable at a release site because releases are often made at the edge of a patch, the terrain is rough and the density of a weed patch changes from the edge to mid-patch.

An area 5 to 10 m, square, from the GPS located centre of the release site was selected for monitoring. The number of beetles collected in a sweep net was counted and the data was expressed as number of beetles per sweep. Usually, 3 sweeps per sample and 2 samples were taken per site. When the beetle population was low the number of sweeps was increased to 5. The following information was collected for a release site: release number*, waypoint number*, legal description*, latitude*, longitude*, rural municipality number*, year monitored, date monitored, time, temperature, weather conditions, number of flowering plants, height of flowering plants, percent cover of leafy spurge, percent cover grasses and forbs, percent cover bare ground, percent cover woody plants, number of leafy spurge beetles per sweep, percent black beetles, percent black dot beetles, record of photographs taken, miscellaneous information and contact person. Information marked with an * was pre-recorded onto a pocket PC at a release site. The other data was entered into a pocket PC in the field. The information collected was entered into the 2006 Saskatchewan U-Pick Leafy Spurge Flea Beetle Information Guide (Appendix 4, pages 1 to 108).

Monitoring method for scentless chamomile seed weevils

Seed weevil release sites were located using a Global Position System (GPS) navigation receiver with an error of ± 3 m. Weevils on scentless chamomile plants at a release site were counted first. Then weevils on plants nearest to the release point were counted. When there were no plants at the release site, scentless chamomile plants that were growing nearest to the release site were monitored for weevils. The number of weevils found on scentless chamomile plants during a 30 minute search was recorded. When all of the plants were searched before 30 minutes, the time of the search was recorded.

The following information was collected for a release site: waypoint number*, legal description*, latitude*, longitude*, rural municipality number*, year monitored*, date (day and month), time, temperature, weather, number of adults counted in 30 min or less, record of photographs taken, miscellaneous information and contact person*. Information marked with an * was pre-recorded onto a pocket PC, for a release site. The other data was entered into a pocket PC in the field. The information collected was entered into the 2006 Scentless Chamomile Biological Control Agent Information Guide (Appendix 4, pages 109 to 168).

Monitoring method for scentless chamomile gall midges

Gall midge release sites were located using a Global Position System (GPS) navigation receiver with an error of ± 3 m. At each site the number of galls found during a 30 minute search to a maximum of 10 galls was recorded. When 10 galls were found, counting stopped. The following information was collected for a release site: waypoint number*, legal description*, latitude*, longitude*, rural municipality number*, year monitored, date (day and month), time, number of galls found, record of photographs taken, miscellaneous information and contact person*. The other data was entered into a pocket PC in the field. Date marked with an * was pre-recorded onto a pocket PC at a release site. The information collected was entered into the 2006 Scentless Chamomile Biological Control Agent Information Guide (Appendix 4, pages 109 to 168).

7. Develop methods for and distribute biocontrol agents

The best opportunity for the spread of biocontrol agents occurs when a leader or a 'champion' is found in a local area. A champion has an interest in biocontrol and will independently promote the use of biocontrol agents for weeds.

Examples of champions are Weed Inspectors, Glenn Chernick and Charlie Carlson, and RM Councillor Calvin Jorstad. They collected leafy spurge flea beetles in 2005 and released them in their rural or urban municipality. While most flea beetles were collected at Maxim, some were collected at Besant. These champions make yearly collections and releases.

Further information on the collection and release of biocontrol agents can be obtained from the following technical articles:

- Bowes, G. 2004b. Where, When and How to Collect and Release Leafy Spurge Flea Beetles, 6pp, available on the Noxious Weed Program CD-ROM
- Bowes, G. 2004c. When and How to Collect and Release Scentless Chamomile Gall Midges, 5pp pp, available on the Noxious Weed Program CD-ROM
- Bowes, G. 2004d. Where, When and How to Collect and Release Scentless Chamomile Seed Weevils, 6pp, available on the Noxious Weed Program CD-ROM

8. Show how biocontrol fits into integrated weed control

Biocontrol agents have a long term effect on their specific weed but the effect is different for each agent. Each agent has a place in Integrated Weed Control.

Integrated Weed Control is the use of a combination of non-conflicting methods to control weeds. The methods can be side-by-side or stacked one method on another method. There are four control methods and they are; Physical, Chemical, Biological and Ecological. Physical control is pulling weeds manually or mechanical by mowing. Chemical control is using a herbicide to control or kill. Biological (Classical) control or biocontrol is using an insect to suppress a weed population. Ecological control uses plants to aggressively compete with weeds or animals to graze weeds.

Leafy spurge

Leafy spurge flea beetles can be observed eating the foliage of leafy spurge but most damage to the weed is caused by the larvae eating the roots. The long term benefit of the beetles is a reduction in the cover of leafy spurge on the soil surface but some leafy spurge will most likely always be present. Photographs and monitoring data was used to show the reduction of leafy spurge populations at the Last Mountain House and Maxim sites. This information was presented in the following articles and Information Booths (Appendix 2, pages 46 – 58):

- SARM Midterm Convention 2005
    - Leafy Spurge Disappears at Maxim
    - A Comparison of the Leafy Spurge Flea Beetles Performance on Four Sites

Near Maxim, three species of *Aphthona* flea beetles were released in a valley for the suppression of leafy spurge. In 1982 brown dot flea beetles (*A. cyparissiae*) and in 1983 black dot flea beetles (*A. nigriscutis*) were released on the south facing slope of the valley. Between 1991 and 1996 black flea beetles (*A. lacertosa*) were released in the valley bottom and on the north ridge. By 2005, leafy spurge had disappeared from a large part of the valley (Figure 6). Because different species of *Aphthona* flea beetles were released at different times it was difficult to determine how long the beetles took to satisfactorily suppress the weed. For large areas of leafy spurge, *Aphthona* flea beetles are the best choice for economical, long-term control.

At Last Mountain House the performance of the black leafy spurge flea beetle was variable by 2005 following their release in 1996. Figure 7 show photographs of four sites (070, 071, 069 and 072). At site 070, a few leafy spurge stems are present in 2005. At site 071, leafy spurge disappeared during 2002 and 2003, only to reappear in 2004 and 2005. At site 069 the weed disappeared whereas at site 072 plenty of stems were present. A complete set of photographs from 2002 to 2005 was presented in the display in the following Information Booth (Appendix 2, pages 51 - 58):

- SARM Midterm Convention 2005
    - A Comparison of the Leafy Spurge Flea Beetles Performance on Four Sites

The best year to collected leafy spurge flea beetles at the Last Mountain House site was in 2003 (Table 1). Each year release sites should be monitored for possible beetle collection. For site 072 at Last Mountain House, only the year 2003 was good for beetle collection.

Table 1 Best Year to Collect Leafy Spurge Flea Beetles at Last Mountain House Historic Park (site 072)

Year	Number of Beetles per Sweep
2000	1
2002	3 – 4
2003	6 – 16
2004	0 – 4
2005	1

A complete documentation of year-to year beetles fluctuation for four sites was presented in the display in the following Information Booth (Appendix 2, pages 51 - 58):

- SARM Midterm Convention 2005
    - A Comparison of the Leafy Spurge Flea Beetles Performance on Four Sites

Figure 6 Reduction in leafy spurge cover between 1991 and 2005 in a valley near Maxim, SK when various species *Aphthona* beetles were released between 1981 and 1996

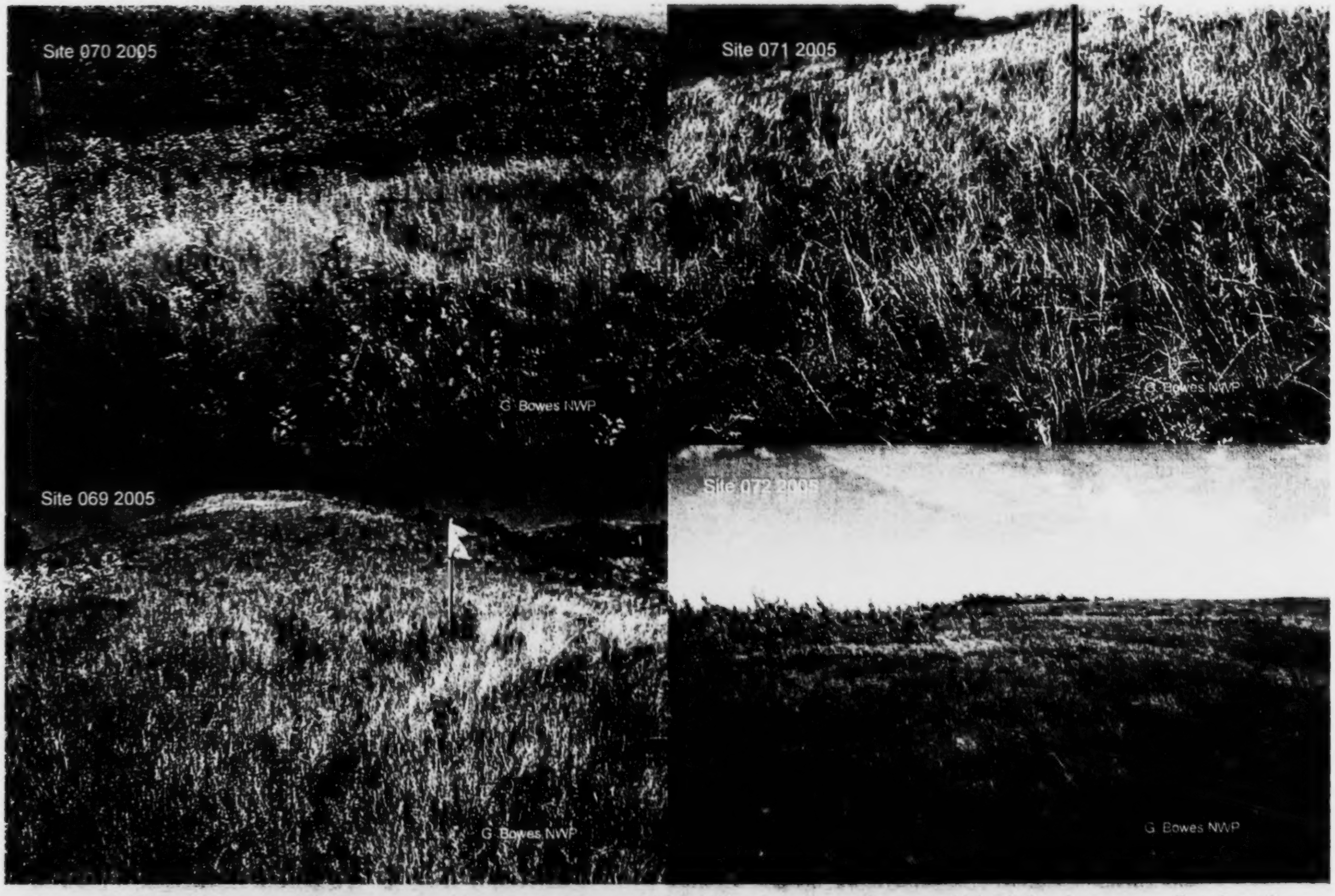

Site 070 2005
Site 071 2005
G. Bowes NWP
G. Bowes NWP
Site 069 2005
Site 072 2005
G. Bowes NWP
G. Bowes NWP

Figure 7 The difference in the cover of leafy spurge in 2005 following the release of black leafy spurge flea beetles in 1996

Scentless chamomile

To survive, the scentless chamomile seed weevil must be able to complete its life cycle, each year, on the weed. One generation of seed weevils is produced per year. The long term benefit of the seed weevil is the yearly consumption of a portion of seed that the scentless chamomile produces. One weevil consumes about 11 seeds (McClay and De Clerck-Floate 1999) and based on a single plant, about 40% of the seed were consumed (Bowes 2002). Seed consumption in the seed weevil's native home in Europe is reported to be about 35% (Peschken et al. 1989).

The life cycle of the scentless chamomile seed weevil is completed in the flower-seed head of the weed (Figure 8). In the spring adult seed weevils lay eggs in bud stage of the flower before and just after the petals appear (Figure 8a). During July when the centre part of the flower turns from a yellow to brown, adults emerge from the pupae (Figure 8b). Figure 8c shows adults in the seed head. In the fall, holes can be observed in the seed head of the weed (Figure 8d). Most likely these holes are the exit holes for adults.

The maximum benefit of the seed weevil is not being achieved because the insect population is not increasing. The main reasons are the lack of scentless chamomile plants on sites where the agent is present or the killing of scentless chamomile plants before the agent's life cycle is complete. Each year scentless chamomile plants must be present for the seed weevil to complete its life cycle. Figure 9 shows four sites where the scentless chamomile seed weevils may have died out or are present in very small numbers.

In Figure 9a, the field was farmed close to the slough during drought years. Scentless chamomile grew in the slough when the surface water disappeared. In wet years, the slough filled with water and the field was farmed to water edge. In the summer-spring of the year, scentless chamomile plants were not found and therefore no seed weevils were found.

Mowing was used to control scentless chamomile on a release site in Figure 9b. The release site was before the pole in Figure 9b. Any seed weevils that moved onto scentless chamomile plants that grew beyond the pole would have had an opportunity to survive. In 2005 seed weevils were not found on this site.

A preferred site for scentless chamomile to grow is along the edge of a field (Figure 9c). In this site scentless chamomile can not compete with invading smooth brome and the field is tilled to the edge of the perennial grass. There is limited space for scentless chamomile to grow. At any one point along the ecotone there can be a few to zero scentless chamomile plants. This situation makes it difficult for a population of seed weevils to rapidly increase.

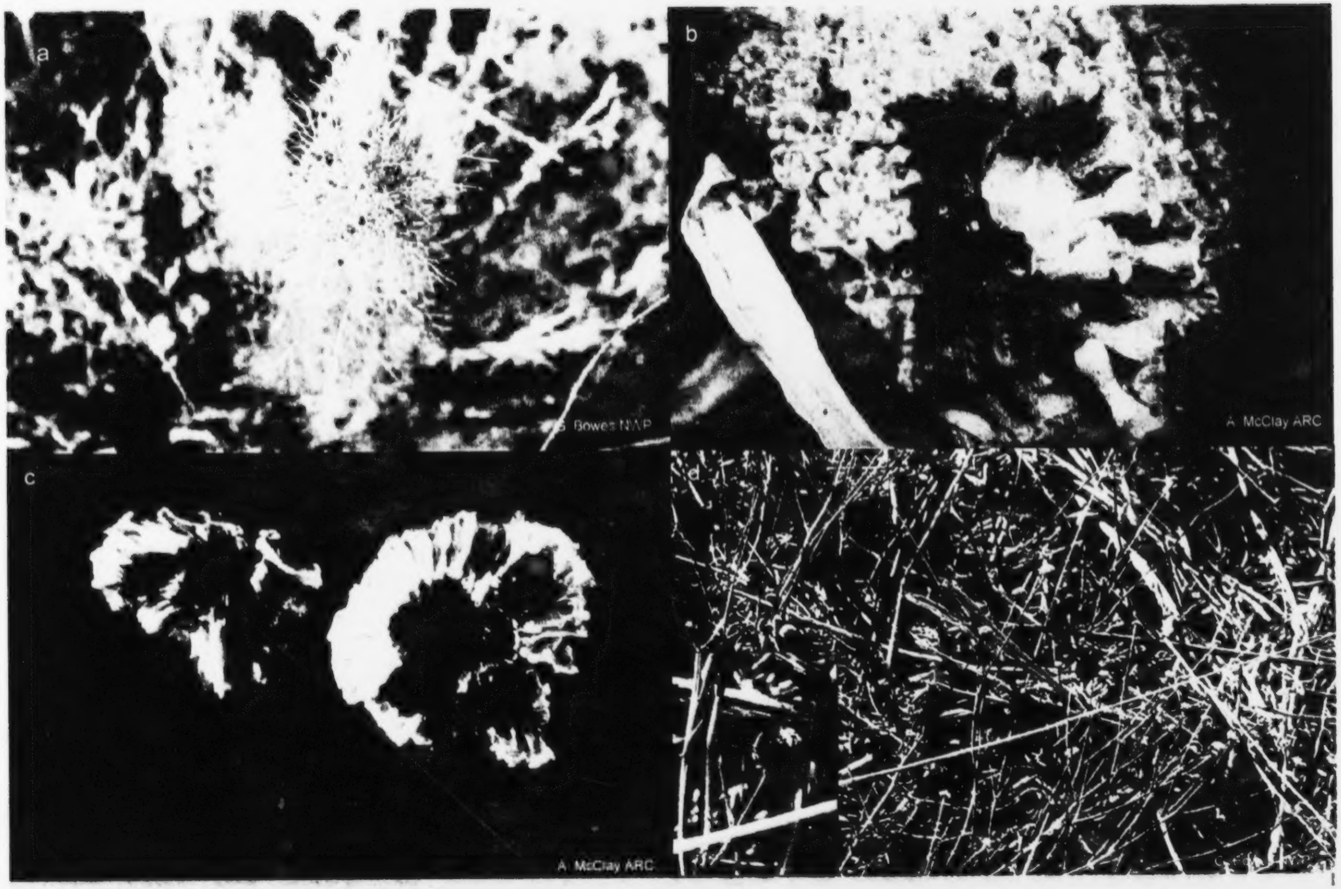

a
b
c
d
S. Bowes NWP
A. McClay ARC
A. McClay ARC

Figure 8 Life cycle of the scentless chamomile seed weevil

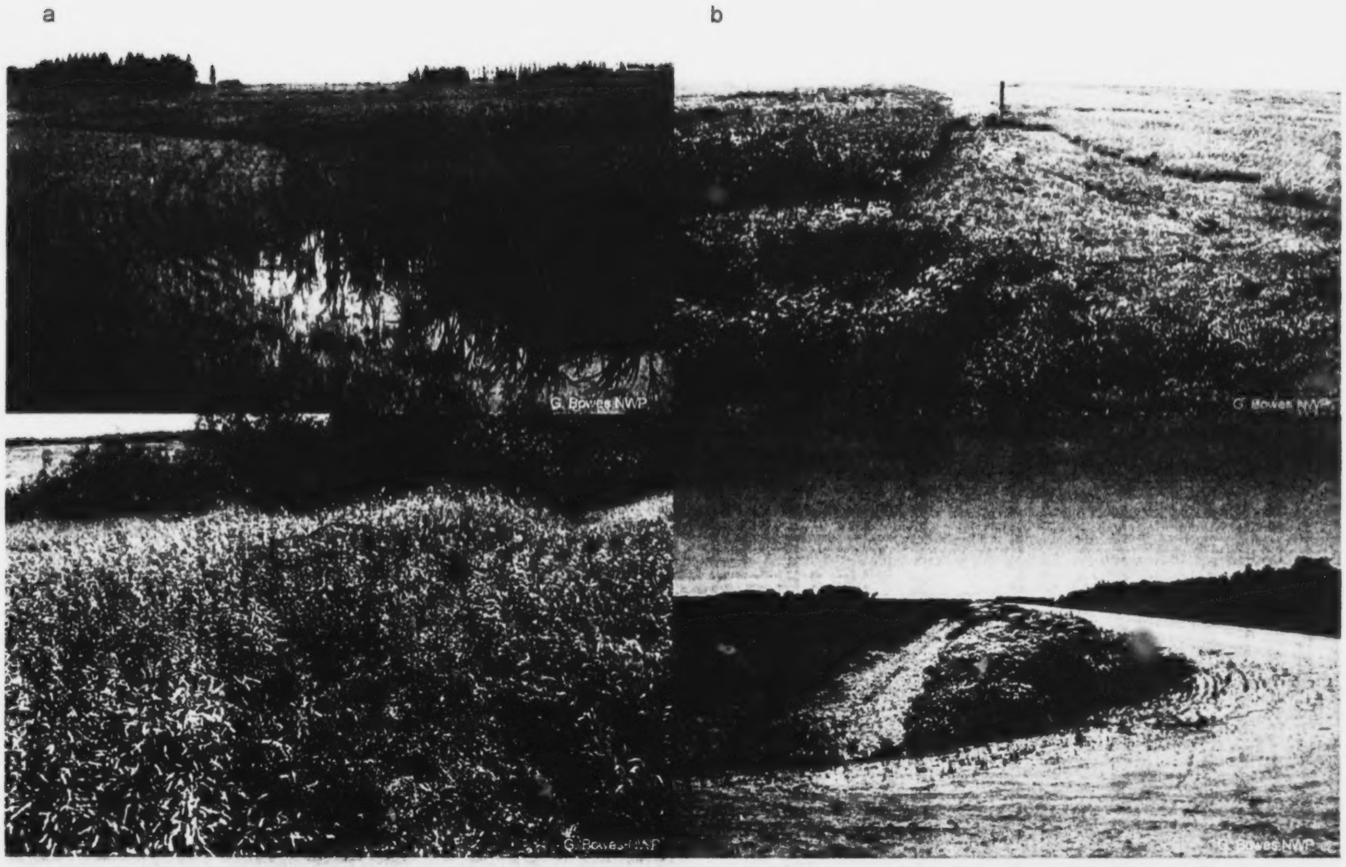

a
b
G. Bowes NWP.
G. Bowes NWP.
G. Bowes NWP.
G. Bowes NWP.

Figure 9 Agricultural activities (a and b), perennial grasses (c) and construction (d) interrupt the life cycle of the scentless chamomile seed weevil

Figure 9d shows scentless chamomile growing on the right-of-way of a new road. Constructing a road through a scentless chamomile seed weevil release site will kill the weevils when all of the plants are killed. After road construction scentless chamomile plants will appear when seed is present in the soil, and they are able to germinate and produce a plant. It is very difficult for scentless chamomile seed weevils to survive when most of the host plants are destroyed.

The best scentless chamomile seed weevil collection sites

Figure 10 shows the 4 best sites in 2005 for the collection of scentless chamomile seed weevils, using the June Seed Weevil Collection method (Bowes 2004d). Sites are excellent for collection when 30 weevils can be brushed into a pill bottle before some try to escape.

The number of weevils counted in 30 minutes during 2005 for the 4 best sites in the province is presented in Table 2.

Table 2 The seed weevil population on the 4 best sites in Saskatchewan in 2005

Site number*	Seed weevils counted in 10 minutes
Site AA13	576
Site 177	244
Site 417	221
Site 178	152

*Site locations found in the 2006 Scentless Chamomile Biological Control Agent Information Guide, available on the Noxious Weed Program CD-ROM

Sites AA13 and 177 were used to collect seed weevils for release in 2005 (Figure 10a, b and c). At site AA13 there are undisturbed patches of scentless chamomile dispersed within the smooth brome stand. The visibility of the scentless chamomile plants is poor because the petals of the oldest bud are just starting to emerge. This is the best time to collect the seed weevils.

Site 177 is a pile of top soil that is not disturbed from year to year (Figure 10c). Periodically soil is added to the pile, which provides a new area for scentless chamomile to grow.

Site 417 has patches of undisturbed scentless chamomile plants growing with established smooth brome, which is similar to site AA13 (Figure 10d).

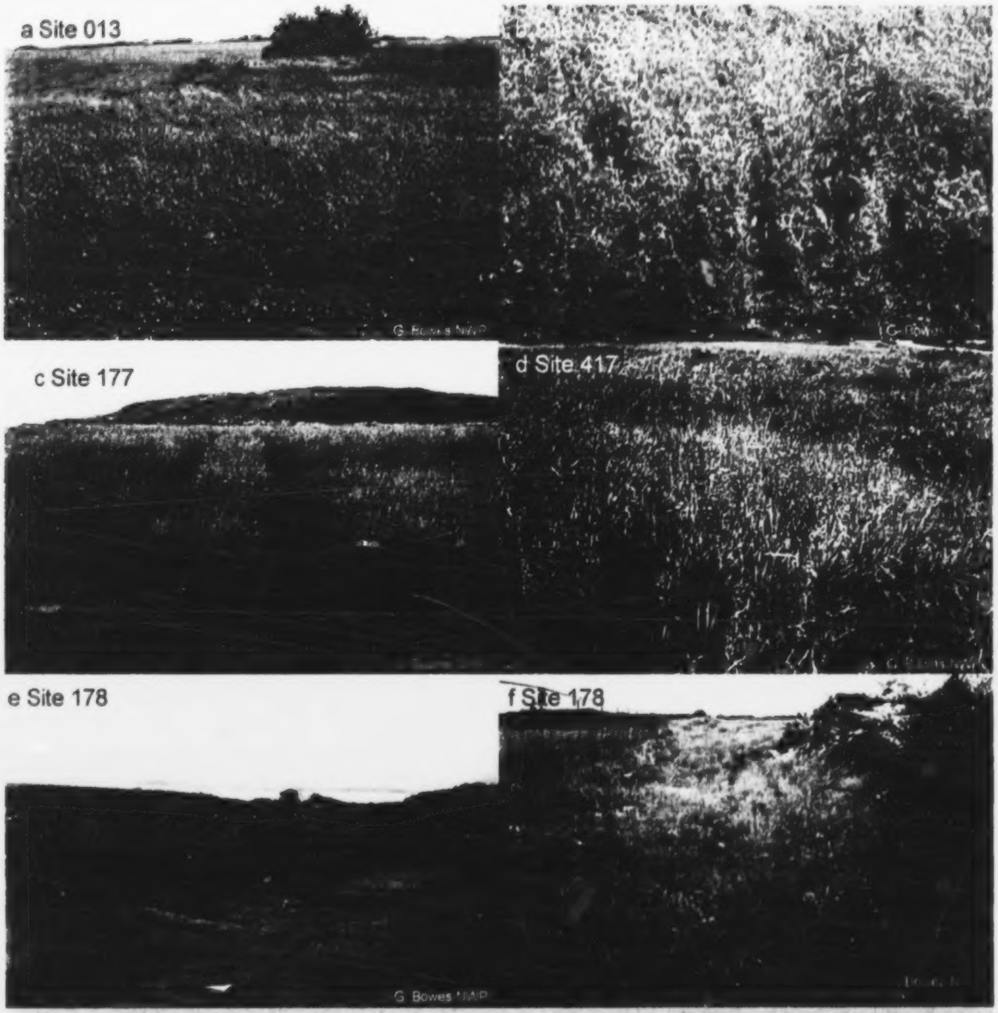

a Site 013
G. Bowes NWP
G. Bowes N
c Site 177
d Site 417
e Site 178
f Site 178
G. Bowes NWP
Bowes N

Figure 10 The four best sites (AA13a, b, 177c, 417d and 178e, f) for collecting scentless chamomile seed weevils in 2005

Site 178 is a landfill area with scentless chamomile growing in a highly disturbed environment (Figure 10e and f). Periodically garbage is disposed at the site by travelling up the hill and dumping the material over the edge of the hill. Figure 10e shows the hill and Figure 10f shows a minimal disturbed area by the dumped garbage. Scentless chamomile is allowed to complete its life cycle in a minimal disturbed area at the bottom of the hill and supports a high seed weevil population.

While sites AA13 and 417 were excellent for seed weevil collection in 2005, they may not be good collection sites in the future because of the highly competitive smooth brome (Figure 10a, b and c). If left undisturbed and soil is continually added to site 177, it should be an excellent place to collect seed weevils. Landfill sites like site 178 should be excellent for seed weevil collection in the future.

The best scentless chamomile gall midge collection sites

An area (site 173) on gravel-soil near Canwood is the best site for collecting gall midges (Figure 11). Figure 11a shows the area where scentless chamomile grows well. The best time to collect gall midges is in the fall after a killing frost. Scentless chamomile rosettes are frost tolerant. Figure 11b show the view of the site when a collector is walking over the site looking for galls. Galls are small and difficult to see. There are galls in the two red circles in Figure 11b. There are 2 plants in the upper circle, one has a gall and one does not. Galls on scentless chamomile plant are easy to find when viewed from a distance of 1 m from the soil surface (11c).

The scentless chamomile gall midge fits into integrated weed control when there is a large population of the agents and they attack a large number of plants (Figure 12). To achieve this there must be an area or 'source area' where scentless chamomile plants are allowed to grow unharmed. From the source area gall midges can travel up to 5.2 km/year (McClay 2003). The size of the source area relative to the size of the area that gall midges can effectively attack a large number of plants is unknown. Also, the damage caused by the gall midges is unknown.

The gall midge produces 2 and perhaps 3 generations in a year. About 35 days are required to complete the life cycle of a gall midge. The midge induces the formation of galls on the growing points of scentless chamomile plants. In the spring, the midges emerge from galls that were formed the previous year on scentless chamomile rosettes and attack bolting stems. Figure 12 shows a gall on the rosette (marked 'a') on scentless chamomile in the fall. Most likely the old gall identified as 'b' in Figure 12 was formed in the spring from an attack by midge(s) in the early spring. By July, gall midges could have emerged and attacked other plants such as the one identified as 'c' in Figure 12. Late in the season the gall midges attack scentless chamomile in the rosette stage, marked 'a' in Figure 12. For gall midges to complete 2 to 3 generations each year, scentless chamomile plants must be growing from early spring to late fall on the source site.

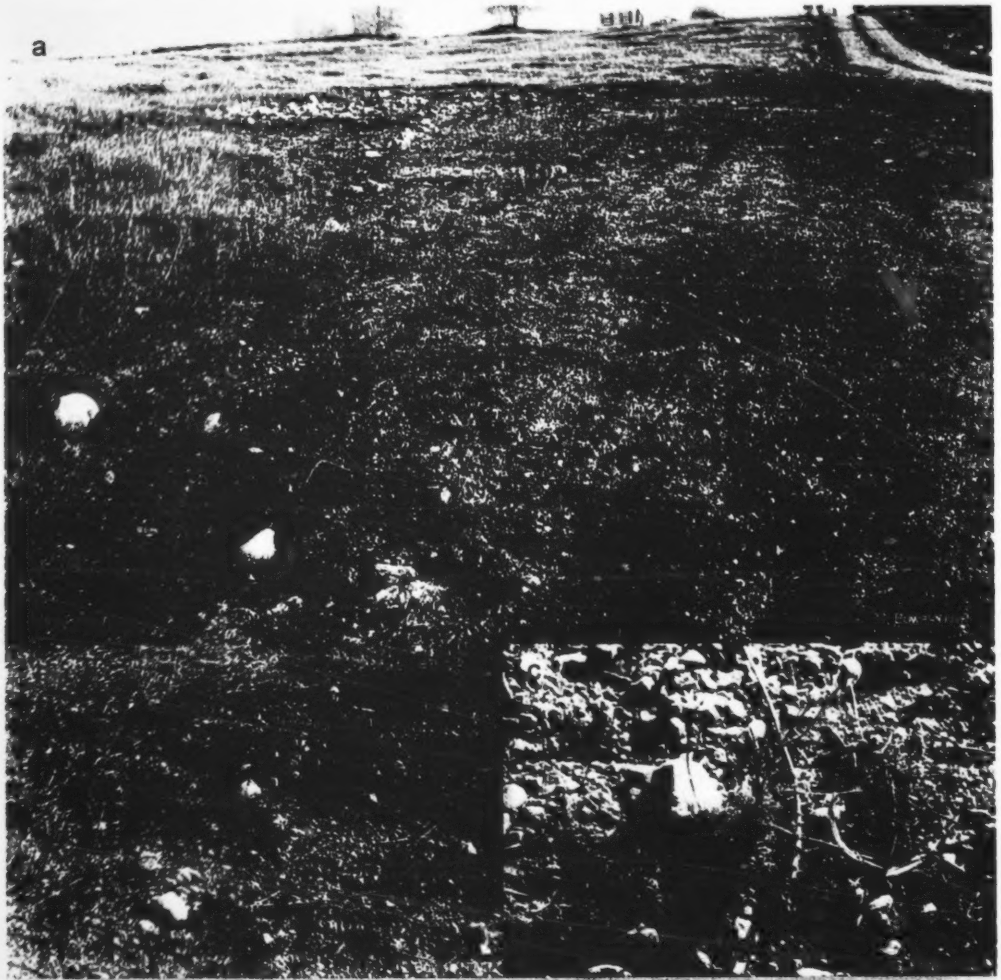


Figure 11 The best site (173) for collecting scentless chamomile gall midges. a) the area, b) galls look small when walking over a release site and c) galls are easy to find from a distance of 1 m

Figure 12 Scentless chamomile plants showing the life cycle of the gall midge. a) gall on a rosette, b) old gall c) gall on a scentless chamomile plant

9. Review extension materials, revise or develop as necessary

Leafy spurge

The following articles were reviewed and judged to be satisfactory technical articles for the control of leafy spurge and incorporating biological control with integrated weed control.

- Anonymous. 2004. Biological Control of Leafy Spurge, 6pp, available from Saskatchewan Agriculture & Food
- Bowes, G. 2004a. Leafy Spurge Control 9pp, available on the Noxious Weed Program CD-ROM
- Bowes, G. 2004b. Where, When and How to Collect and Release Leafy Spurge Flea Beetles, 6pp, available on the Noxious Weed Program CD-ROM
- Anonymous. 1984. Leafy Spurge (N), 2pp, available from Saskatchewan Agriculture & Food
- Anonymous. Managing Leafy Spurge on Native Grassland, 4pp, available from Saskatchewan Watershed Authority.

Leafy spurge flea beetles suppressed leafy spurge that was growing on the Maxim site. A search of old records found 15 slides or prints. Dr. Peter Harris (AAFC), kindly agreed to review numerous photographic slides of the Maxim area. He found 86 relevant slides. All slides and prints were scanned and used to construct a pictorial review of the reduction of leafy spurge on the Maxim site. The pictorial review of successful leafy spurge reduction was presented in an Information Booth display at the Midterm Convention 2005 in Regina on November 8 and 9 (Appendix 2, pages 46 to 50) and is on the Noxious Weed Program CD-ROM. The title of the pictorial review is; Leafy Spurge Disappears at Maxim.

Scentless chamomile

The following articles were reviewed and judged to be satisfactory technical articles for the control of scentless chamomile and incorporating biological control with integrated weed control.

- Bowes, G. 2004c. When and How to Collect and Release Scentless Chamomile Gall Midges, 5pp, available on the Noxious Weed Program CD-ROM
- Bowes, G. 2004d. Where, When and How to Collect and Release Scentless Chamomile Seed Weevils, 6pp, available on the Noxious Weed Program CD-ROM
- Bowes, G. and C. Brenzil. 2004a. Scentless Chamomile: Distribution, 3pp, available from Saskatchewan Agriculture & Food
- Bowes, G. and C. Brenzil. 2004b. Scentless Chamomile: Habitats, 3pp, available from Saskatchewan Agriculture & Food

- Bowes, G. and C. Brenzil. 2004c. Scentless Chamomile: Identification, 3pp, available from Saskatchewan Agriculture & Food
- Bowes, G. and C. Brenzil. 2004d. Scentless Chamomile: Seed Production and Germination, 3pp, available from Saskatchewan Agriculture & Food
- Bowes, G. and C. Brenzil. 2004e. Scentless Chamomile: Weed Management, 3pp, available from Saskatchewan Agriculture & Food
- Bowes, G. and C. Brenzil. 2004f. Scentless Chamomile: Yield Losses, 3pp, available from Saskatchewan Agriculture & Food
- Brenzil, C. 2004. Scentless Chamomile, 4pp, available from Saskatchewan Agriculture & Food
- Anonymous. Controlling Scentless Chamomile in Native Grassland, 4pp, available from Saskatchewan Watershed Authority.

10. Presentations to workshops, clinics, farmer meetings

Leafy spurge

Information supporting the integrated control of leafy spurge was presented in print format at Information Booths that were set up at the SARM Convention, Midterm Convention and District Meetings, and the WITCs. Presentations were developed and delivered at WITCs.

1. Prepared and delivered three presentations at the WITCs 2005 on April 12 in Humboldt, April 13 in Rosetown and April 14 in Indian Head (Appendix 3, pages 1 to 11).

Presentation Titles:

- Preventing Weed Spread: Theory, Strategy & Practice

  This presentation outlined the approach to use to prevent weed spread using integrated weed control. Included was an explanation of the invasion process for leafy spurge.

- The Dilemma! Scentless Chamomile Control

  This presentation explained the problems associated with the use of scentless chamomile seed weevils and gall midges for the suppression of scentless chamomile. The dilemma is the on-going agricultural and industrial activities in association with competitive perennial grasses that greatly reduce the number of scentless chamomile plants, which prevent the build up of the biocontrol agent populations.

- Controlling Leafy Spurge with Critters - Beetles and Sheep

This presentation outlined the long term methods that must be used to control-suppress leafy spurge when leafy spurge flea beetles and sheep are used independently or alone.

2. Set up Information Booths at the WITCs 2005 (Appendix 2, pages 1 to 30). The same Information Booths were used at WITCs that were set up at the Midterm Convention 2004, November 9 – 10 and SARM Convention 2005, March 7 – 10, both in Saskatoon. Using the same Information Booths at WITCs as at SARM events allowed Weed Inspectors to receive the same information as the Reeves and Councillors. Generally, Weed Inspectors attend WITCs whereas Reeves and Councillors attend SARM events. This helps to harmonizes decision making at the municipal level.

Titles for Information Booth topics at WITCs 2005 and previously at SARM Midterm Convention 2004 (Appendix 2, pages 1 to 15):

- Let Research Answer Your Questions

  This is the introductory part for the Information Booth that explained why certain research articles were selected. Information presented answered some of the questions that are often asked by Weed Inspectors.

- Will Viable Seed of Leafy Spurge Pass Through the Digestive Tract of Sheep?

  A research article on animals passing viable seed was summarized. Sheep pass a small percentage of viable seed through their digestive tracts. The clean out time for sheep was 4 – 5 days.

- Recovery of Leafy Spurge Seed from Sheep

  A second research article on animals passing viable seed was summarized. Viable leafy spurge seed was collected from fresh manure. The clean out time for sheep was 5 days. Sheep grazing leafy spurge will pick up seeds in their fleece. Seed may drop before becoming embedded but once embedded, seeds would most likely only fall out during shearing and processing.

- Leafy Spurge Suppression with Flea Beetles

  A research article was summarized. There was a gradual loss of root weight over 7 to 8 years to 16% of the original root weight. Beneficial foliage cover reduction did not occur until 5 years after insect release. After 7 to 8 years, leafy spurge foliage covered 6 to 7% of the soil surface.

- Biological Control of Leafy Spurge with Beetles

A research article was summarized. Black dot flea beetles reduced the stem density of leafy spurge by ~65% and black flea beetles reduced the stem density to 95% or better in the southern part of North Dakota.

- How Does Leafy Spurge Grow

  Using a photograph of a two-year old leafy spurge plant, the growth of the weeds massive root system was explained.

- Long Term Control of Leafy Spurge with Flea Beetles

  Using photographs of release sites taken over several years, an explanation of why flea beetles do not eradicate leafy spurge was presented. As the food supply (leafy spurge) dwindles, a small number of beetles will be present on a few remaining stems.

- Why Every Municipality Needs a Proactive Weed Inspector

  A proactive Weed Inspector has a better chance than a reactive Weed Inspector of finding a new weed when it is first introduced into an area.

- Always Appoint a Weed Inspector to Stop Weed Spread

  A proactive Weed Inspectors has the best opportunity to eradicate a weed because he will find the weed when it grows in a small patch.

- Leafy Spurge in the Fall

  Fall can be a good time to scout for leafy spurge because the weed is easy to spot. Stems are upright and some of stems are crimson red.

Titles for Information Booth topics at WITCs 2005 and previously at SARM Convention 2005 (Appendix 2, pages 16 to 30):

- The Conflict Between Agricultural Activities and Biological Control

  Every time an agricultural activity disturbs an area with established grasses, forbs and scentless chamomile, the weed can either be controlled or a better habitat is created for the weed's growth. For the agent to be successful, scentless chamomile must always be present. The dilemma for a Weed Inspector is; the biological control agent can only survive and increase when scentless chamomile is present.

- Weed Management Areas

Weed Management Areas (WMAs) are local organizations that bring together land managers and owners to manage a common weed problem in a common area. The common area is the area of land that is occupied by the weed. WMAs are a partnership of neighbouring landowners and users for the purpose of coordinating efforts and expertise against invasive plants and noxious weeds.

3. Prepared and delivered a presentation at the Livestock Development Branch Meeting, April 25, 2005 in Saskatoon (Appendix 3, pages 12 to 15).

Presentation Title:

- Weed Management Areas and The Noxious Weed Program

4. Prepared and manned a new Information Booth at the SARM District Meetings 2005; June 14 in Battleford, June 15 in Saskatoon, June 16 in Kelvington, June 21 in Swift Current, June 22 in Moose Jaw and June 23 in Kipling (Appendix 2, pages 31 to 42).

Titles for Information Booth topics at the SARM District Meetings:

- The Proactive Weed Inspector

  The approach of a proactive compared to a reactive Weed Inspector was explained. A proactive Weed Inspector looks for noxious weeds before the weeds spread and becomes a serious weed problem.

- Stop the Spread of Leafy Spurge

  This part of the Information Booth explains how to stop weed spread. To stop the spread of noxious weeds like leafy spurge, Weed Inspectors should use the proven weed control strategy of Exclusion, Eradication and Containment.

- Leafy Spurge Flea Beetle Collection and Distribution

  For successful suppression of leafy spurge, many beetle releases should be made. A procedure for many releases over a large area was suggested. The following two pamphlets were included with the display.

  - Bowes, G. 2004a. Leafy Spurge Control 9pp, available on the Noxious Weed Program CD-ROM

  - Bowes, G. 2004b. Where, When and How to Collect and Release Leafy Spurge Flea Beetles, 6pp, available on the Noxious Weed Program CD-ROM

- Example of a Large Scale Beetle Release

The example selected was Theodore Roosevelt National Park in North Dakota. Over 12 million *Aphthona* flea beetles were released in the Park.

5. Prepared and delivered a presentation at the SARM District Meetings 2005; June 14 in Battleford (Appendix 3, page 15).

    - Noxious Weed Program

6. Prepared material for an Information Booth display and manned the booth at the Midterm Convention 2005 in Regina on November 8 and 9 (Appendix 2, pages 43 to 63).

Titles for Information Booth topics at the Midterm Convention 2005:

- Leafy Spurge Flea Beetle Identification
    - Black Dot Flea Beetle (*Aphthona nigriscutis*)
    - Brown Dot Flea Beetle (*Aphthona cyparissiae*)
    - Black Flea Beetle (*Aphthona lacertosa*)

- Leafy Spurge Disappears at Maxim

  Old photographs were matched with photographs taken in 2005 to show the spectacular disappearance of leafy spurge at Maxim.

- A Comparison of the Leafy Spurge Flea Beetles Performance on Four Sites

  Photograph taken each year from 2002 to 2005 of four sites at Last Mountain House Historic Park were used to show how different weed suppression can be from site to site.

- What happens when leafy spurge control is neglected!

  A photograph of a large area shows how leafy spurge dominates an area when not controlled.

- Leafy Spurge: Everyone's Problem

  Photographs of leafy spurge growing at a sport complex, a resort, on a river bank and, in pasture and rangeland show the extent of the leafy spurge problem in the province.

- 2005 Weed Inspector Appointments

Maps of the province showed municipalities with Weed Inspector appointments for 2004 and 2005. In 2004 there were 171 rural and 7 urban municipalities with appointed Weed Inspectors. In 2005 there were 186 rural and 10 urban municipalities with Weed Inspectors.

7. Prepared material for an Information Booth display and manned the booth at the SARM Convention 2006 in Regina on March 6 and 9 (Appendix 2, pages 64 to 78).

Titles for Information Booth topics at the SARM Convention 2006:

- Leafy Spurge: Biology Ecology Management

  Information from the bulletin; Leafy Spurge: Biology, Ecology and Management by Goodwin et al. was summarized but modified for Canadian conditions. The bulletin was based on information found on the CD-ROM; Purge Spurge: Leafy Spurge Data Base, Version 4.0.

- Leafy Spurge Beetles Life Cycle

  Details of the four stages of the life cycle were summarized in bullet format, using mostly Canadian data to reflect the cold climate.

- Long Term Leafy Spurge Suppression with Beetles

  Yearly monitoring data on the performance of flea beetles from pastures in the province was related to recent research data from North Dakota. This comparison shows that when the soil is sandy, the black dot and brown dot flea beetles will only thin out leafy spurge.

- Scentless Chamomile Gall Midge

  The life cycle of the gall midge is related to the need for different stages of scentless chamomile plants during the growing season.

- Best Sites for Seed Weevils and Gall Midges

  Photographs are shown of the best sites for the population growth of the scentless chamomile seed weevil and gall midge. Reasons why the biocontrol agents do well at these sites are given.

11. Prepare a report documenting agent location

Leafy spurge

Monitoring information collected during the summer of 2005 was entered into the 2006 Saskatchewan U-Pick Leafy Spurge Flea Beetle Information Guide (Appendix 4, pages 1 to 108). This is an electronic report that is made available to individuals and organizations that are interested in collecting and releasing biocontrol agents. Data from 106 leafy spurge beetle release sites were entered into the e-report.

Scentless chamomile

Monitoring information collected during the summer of 2005 was entered into the 2006 Scentless Chamomile Biological Control Agent Information Guide (Appendix 4, pages 109 to 168). This is an electronic report that is made available to individuals and organizations that are interested in collecting and releasing biocontrol agents. Data from 26 scentless chamomile seed weevil release sites and 32 scentless chamomile gall midge release sites were entered into the e-report.

12. Obtain the GPS location for release sites and map

Waypoints for the monitored sites were previously recorded and are found in the 2006 Scentless Chamomile Biological Control Agent Information Guide and the 2006 Saskatchewan U-Pick Leafy Spurge Flea Beetle Information Guide (Appendix 4, pages 1 to 168). New waypoints obtained during the year and from provincial organizations and Weed Inspectors were entered into the reports. When workers from the Saskatchewan Lands Branch and Water Shed Authority release biological control agents, the GPS reference points are obtained and entered into the monitoring reports. New releases with recorded waypoints made by Weed Inspectors were entered into the 2006 Scentless Chamomile Biological Control Agent Information Guide. The map of waypoints used for local area mapping was up dated for 2006 (Figure 1, 2 and 3).

13. Develop and deliver a roadside weed control program

Leafy spurge and scentless chamomile

Information on how to develop and implement a roadside weed control program and how to prevent weed spread was based on integrated weed control. The approach used weed Awareness, Education and Control. Awareness is informing Weed Inspectors and the public of the danger of new invasive plants and noxious weeds. An important part of Awareness is weed identification. Education is learning about the biology and ecology of weeds. Control is the use of Integrated Weed Control methods such as biocontrol, chemical, ecological and physical. The strategy used was weed Exclusion, Eradication and Containment. Exclusion means using quarantine to keep new and noxious weeds at far away locations. Eradication is the reduction of a population of weeds to zero. Containment is keeping a weed population within a specific area. The procedure to control weeds uses 1) scouting for a weed, 2) controlling the weed using Integrated Weed Control and then 3) monitoring for success of the control treatment.

Articles The articles that were published in the Rural Councillor from April 2005 to March 2006 were designed to make professional agriculturists, the public and Weed Inspectors aware of issues that are important for effective noxious weed control. Most of the topics were authored as a response to questions and events that were raised by professional agriculturists, the public and Weed Inspectors.

1. Bowes, G. 2005. Weed Management Areas. Rural Councillor. April/May Vol. 40 (2), 22 (Appendix 2, page 1).

2. Bowes, G. 2005. Flea Beetles Destroy Leafy Spurge Roots. Rural Councillor. June/July Vol. 40 (3), 19 (Appendix 2, page 2).

3. Bowes, G. 2005. Invasive Plants are a Rural-Urban Problem. Rural Councillor. August/September Vol. 40 (4), 25 – 26 (Appendix 2, page 3 – 4).

4. Bowes, G. 2005. Leafy Spurge Control with Flea Beetles, Sheep and Herbicides. Rural Councillor. October/November Vol. 40 (5), 19 – 20 (Appendix 2, pages 5 – 6).

5. Bowes, G. 2005. Weed Seed Viability in Manure, Silage and Compost. Rural Councillor. December 2005/January 2006 Vol. 40 (6), 18 – 19 (Appendix 2, pages 7 – 8).

6. Bowes, G. 2006. Leafy Spurge Disappears at Maxim. Rural Councillor. February/March Vol. 41 (1), 00 - 00. (In press)

Compact Disks (CD-ROM) Articles published in the Rural Councillor were burned on to a CD-ROM. Also on the CD-ROM was information from Information Booths at SARM Conventions, field day handouts, PowerPoint presentations, maps, slide libraries, technical articles and posters that were developed through the Noxious Weed Program from 2003 to 2006. On-line biological control articles and articles for the control of scentless chamomile and leafy spurge were added to the CD-ROM. The newest CD-ROMs contained maps showing rural municipalities with Weed Inspectors. The CD-ROM contained 519, 8.5 x 11 inch pages, of images.

- Gave away 46 copies of the Noxious Weed Program CD-ROM to those attending the SARM Midterm Convention 2005

- Gave away 152 copies of the Noxious Weed Program CD-ROM to those attending the six SARM District Meetings 2005

Photographs of monitored sites were burned onto 4 CD-ROMs.

Information Booths Information on integrated weed control was presented in booths at the SARM Conventions and District Meetings. The target audiences were Reeves, Councillors and a few Weed Inspectors. The method of expression that best presented the information on how to stop the spread of weeds was an Information Booth.

Similar information was presented to Weed Inspectors, landowners, and a few Reeves and Councillors at the WITCs. Information Booths that were at the SARM Conventions, SARM Midterm Conventions and SARM Districts Meetings were used at the WITCs. By doing this, similar information was provided to Reeves and Councillors who make the decisions on weed control expenditures and Weed Inspectors who are responsible for enforcing the act.

1. Set up information booths at the WITCs 2005. Used the same Information Booths that were set up at the Midterm Convention 2004, November 9 – 10 and SARM Convention 2005, March 7 – 10, both in Saskatoon (Appendix 2, pages 1 – 30).

2. Prepared and manned a new Information Booth at the SARM District Meetings 2005; June 14 in Battleford, June 15 in Saskatoon, June 16 in Kelvington, June 21 in Swift Current, June 22 in Moose Jaw and June 23 in Kipling (Appendix 2, pages 31 – 42).

3. Prepared material for an Information Booth display and manned the booth at the Midterm Convention 2005 in Regina on November 6 and 9 (Appendix 2, pages 43 – 63).

4. Prepared material for an Information Booth display and manned the booth at the SARM Convention 2006 in Regina on March 8 to 9 (Appendix 2, pages 64 – 78).

References

Anonymous. 2004. Biological Control of Leafy Spurge, 6pp. Available from Saskatchewan Agriculture & Food.

Anonymous. 1984. Leafy Spurge (N), 2pp. Available from Saskatchewan Agriculture & Food.

Anonymous. Managing Leafy Spurge on Native Grassland, 4pp. Available from Saskatchewan Watershed Authority.

Bowes, G. 2004a. Leafy Spurge Control, 9pp. Available on the Noxious Weed Program CD-ROM, 519 pp.

Bowes, G. 2004b. Where, When and How to Collect and Release Leafy Spurge Flea Beetles, 6pp. Available on the Noxious Weed Program CD-ROM, 519 pp.

Bowes, G. 2004c. When and How to Collect and Release Scentless Chamomile Gall Midges, 5pp. Available on the Noxious Weed Program CD-ROM, 519 pp.

Bowes, G. 2004d. Where, When and How to Collect and Release Scentless Chamomile Seed Weevils. Available on the Noxious Weed Program CD-ROM, 519 pp.

Bowes, G. and C. Brenzil. 2004a. Scentless Chamomile: Distribution, 3pp. Available from Saskatchewan Agriculture & Food

Bowes, G. and C. Brenzil. 2004b. Scentless Chamomile: Habitats, 3pp. Available from Saskatchewan Agriculture & Food

Bowes, G. and C. Brenzil. 2004c. Scentless Chamomile: Identification, 3pp. Available from Saskatchewan Agriculture & Food

Bowes, G. and C. Brenzil. 2004d. Scentless Chamomile: Seed Production and Germination, 3pp. Available from Saskatchewan Agriculture & Food

Bowes, G. and C. Brenzil. 2004e. Scentless Chamomile: Weed Management, 3pp. Available from Saskatchewan Agriculture & Food

Bowes, G. and C. Brenzil. 2004f. Scentless Chamomile: Yield Losses, 3pp. Available from Saskatchewan Agriculture & Food

Bowes, G. 2002. Noxious Weed Management Program Final Report. Weed Control Initiative: Technology Adoption and Demonstration Project Number: 98000158.

Brenzil, C. 2004. Scentless Chamomile, 4pp. Available from Saskatchewan Agriculture & Food.

Goodwin, K., R. Sheley, R. Nowierski and R. Lym. Date unknown. Leafy Spurge: Biology, Ecology and Management. Available from Montana State University, Bozeman, MT.

Lym, R.G and J.A. Nelson. 2000. Biological Control of Leafy Spurge (*Euphorbia esula*) with *Aphthona* spp. along Railroad Right-of-Ways. Weed Tech. 14: 642–646.

McClay, A.S. 2003. Field releases and evaluation of biological control agents for scentless chamomile. Final report for ADF, Project number 98000311.

McClay, A.S. and R. De Clerck-Floate. 1999. Establishment and early effects of *Omphalapion hookeri* (Kirby) (Coleoptera: Apionidae) as a biological control agent for scentless chamomile, *Matricaria perforate* Merat (Asteraceae). Biological Control 14: 85 – 95.

Peschken, D.P., A.G. Thomas, G.G. Bowes and D.W. Douglas. 1989. Scentless chamomile (*Matricaria perforate*) – A new target weed for biological control. Proc. VII. Int. Symp. Biol. Contr. Weeds 6 – 11 March 1988. Rome, Italy.

(c) Personnel

Dr. Garry Bowes, Coordinator, Noxious Weed Program

(d) Equipment

Nil

(e) Project Development Materials

See Appendix 1 for articles published in the Rural Councillor, Appendix 2 for the contents of the Information Booths, Appendix 3 for presentations and Appendix 4 for information that was collected on monitored sites. See the CD-ROM: Noxious Weed Program, for long term information on the project.

(f) Project Photos

A photograph was taken of each release site that was monitored in 2005. Prints were developed and a CD-ROM was made. The film development company put the photographs from many of the films on the CD-ROM backwards and in one case mixed up the film order. All photographs were checked against field notes, corrected and burned on to CD-ROMs. Each e-photograph was coded and the code was entered into the 2006 Scentless Chamomile Biological Control Agent Information Guide and the 2006 Saskatchewan U-Pick Leafy Spurge Flea Beetle Information Guide.

Photographs of monitored sites were burned onto 4 CD-ROMs.

(g) Acknowledgement

The following acknowledgement appeared at the end of Information Booths, PowerPoint presentations and print articles:

Financial support for The Noxious Weed Program is provided by the Canadian Adaptation and Rural Development Fund in Saskatchewan (CARDS) and Agriculture Development Fund (ADF) to Saskatchewan Association of Rural Municipalities (SARM) in collaboration with Saskatchewan Agriculture and Food (SAF). Funding for the CARDS Program is provided by Agriculture and Agri-Food Canada.

(h) Expense Statement

A statement was submitted in a separate report.

(i) ICAR Data Entry

Not known.

Weed Management Areas

Dr. Garry Bowes
Noxious Weed Program

Bob Parsons* championed the use of Cooperative Weed Management Areas as a process for organizing neighbouring landowners to effectively control weeds. This organizational method is widely accepted throughout the mid-west and western states. In California the name has been shortened to Weed Management Areas. This process for organizing weed control is worth considering for use in Saskatchewan.

Weed Management Areas (WMAs) are local organizations that bring together land managers and owners to manage a common weed problem in a common area. WMAs are a partnership of neighbouring landowners and users for the purpose of coordinating efforts and expertise against invasive plants and noxious weeds. Participants in WMAs could be owners of private land, industrial land users and land managers responsible for city, provincial and federal lands.

In Saskatchewan, a WMA could function under a District Agricultural Development and Diversification (ADD) Board or as a stand-alone organization. It may be advisable for a WMA to develop a memorandum of understanding (MOU) among neighbouring landowners for the greatest good of the group to prevent the reproduction and spread of weeds. Attention should be given to the *Noxious Weed Act* and the invasive exotic species that are identified in the Biodiversity Action Plan for Saskatchewan's Future 2004-2009. Leafy spurge is a designated noxious weed and is also identified as an invasive exotic species. The *Noxious Weed Act* has been in force in Saskatchewan since 1909, reflecting undesirable plants from the agricultural perspective. Saskatchewan Environment has recently produced a five year plan to preserve biodiversity that has an invasive species component including invasive plants. **The beneficial feature of a WMA is the attempt to address noxious weeds that are specified under an agricultural act and exotic invasive plants that are a major threat to biodiversity in the native plant communities.**

Weed infestations do not recognize political boundaries whereas Weed Inspectors are bound by municipal boundaries. Often Weed Inspectors wonder about the extent of their authority on provincial and federal lands. Once a weed like leafy spurge is found, government agencies, private landowners and wildlife agencies may not have budgeted for an expensive weed control project that is needed to effectively stop the weed's spread.

To effectively control large infestations of weeds it is important to take care of weed spread using the same lines of attack that the weed takes. Develop weed control practices that are based on natural ecosystems rather than on political boundaries. It is important to take advantage of every resource available to strengthen our defences against weeds. Landowners need to be willing to venture out of their comfort zone, band together and control weeds as a cooperative venture.

A WMA is not a new concept. Weed Inspectors have worked for years with industrial, government or private landowners to develop a noxious weed control plan that suits the organization with the weed problem and the local community. It is time consuming and divisive to produce ad-hoc control programs, one landowner at a time, and realize that not all landowners are controlling their weeds to the same standard. WMA is a term for a local organization that integrates all weed management resources across jurisdictional boundaries in order to benefit the entire community. The value of a WMA for a Weed Inspector is to have one local umbrella organization for the control of noxious weeds.

The most obvious reasons for forming WMAs is to organize to get the job done and coordinate funding. District ADD Boards are a legal identity that can develop requests and submit them for funding. Members of a WMA will be aware of various sources where funding requests can be directed. Check the fine print on funding applications because funds are often available for innovative ideas on weed control rather than for operational expenses. Other reasons for WMA are:

- Increased cost efficiency;
- Sharing budgets;
- Sharing expertise;
- Sharing equipment, labour, and/or supplies;
- Sharing ideas;
- Increased public awareness;
- Build positive relationships; and
- Overcome old animosities.

There are a number of issues to discuss and decisions to make when forming a WMA. The boundaries of infestation for the worst weeds need to be established. From this information the potential partners are identified. The next step is to establish a Steering Committee with assigned responsibilities. The Steering Committee should select someone (or group) to be the leader and determine their common goals. The Steering Committee will want to develop agreement among the partners. Eventually the WMA group should elect officers; Chairman, Vice Chairman, Financial officer and others. Once this is organized within a WMA there is a need to establish long term goals and objectives, a Management Plan (MP) and develop an Annual Operating Plan (AOP). The length of the MP should be a minimum of 5 years and the AOP should be implemented on an annual basis.

In the USA, WMAs are proving to be one of the most effective ways to manage weeds on large areas, which cross jurisdictional areas. 'Weeds know no boundaries' so why should those who want to control the spread of noxious weeds and exotic invasive species.

Weed Inspectors are in a good position to play a major leadership role in the formation and function of WMAs. Weed Inspectors know how to control weeds and communicate with landowners with noxious weeds.

Since 1999, the Noxious Weed Program has been part of the yearly Weed Inspector Training Clinics. The theory behind the information presented is:

- An approach to prevent weed spread which is Weed Awareness, Education and Control (Integrated Weed Control).
- A strategy to prevent weed spread which is Exclusion, Eradication and Containment.
- A procedure to use Integrated Weed Control which involves
    - scouting for a weed,
    - controlling the weed and
    - monitoring for success.

The above is similar to weed management priorities that are found in the Invasive Plant Management Textbook for the development of WMAs. These are:

- First — Prevention of potential invaders;
- Second — Control of new and invading species new to a particular part of the WMA; and
- Third — Containment and management efforts on established stands.

The textbook is available online from the Center for Invasive Plant Management in Montana.

Dr. Garry Bowes is the Coordinator of the Noxious Weed Program (p 306.933.7695, f 306.933.7352, e gbowes@agr.gov.sk.ca). Financial support for The Noxious Weed Program has been provided by the Canadian Adaptation and Rural Development Fund in Saskatchewan (CARDS) and Agriculture Development Fund (ADF) to Saskatchewan Association of Rural Municipalities (SARM) in collaboration with Saskatchewan Agriculture, Food and Rural Revitalization (SAFRR). Funding for the CARDS Program is provided by Agriculture and Agri-Food Canada.

**Bob Parsons is the Supervisor for the Park County Weed and Pest Control District in North West Wyoming. He has worked for the District for 26 years. This is a summary of a presentation that Bob made at 'Invasive Plants: Understanding The Threat Conference' that was held in Calgary, Alberta during October 2003. Additional information was gleaned from the web pages for Weed Management Areas in California and Invasive Plant Management Textbook from the Center for Invasive Plant Management in Montana.* ■

Flea Beetles Destroy Leafy Spurge Roots

Dr. Garry Bowes

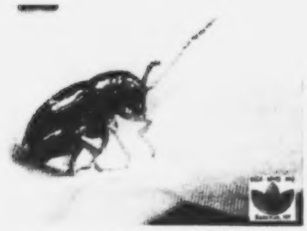


Figure 1 Adult leafy spurge flea beetle

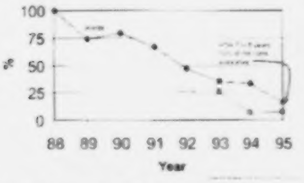
NOXIOUS WEED PROGRAM

Flea beetles are a long term biological control method for leafy spurge. Adult flea beetles are commonly seen feeding on the foliage of leafy spurge plants in July. What you see is not the devastating damage that the beetles can cause. The damage caused by beetles on leafy spurge occurs when the larvae feed on and eventually destroy the roots of the weed.

Figure 1 shows an adult leafy spurge flea beetle on a leafy spurge flower. Larvae, in an advanced stage, are shown feeding on roots of leafy spurge in Figure 2.

There is one generation of leafy spurge flea beetles produced each year. Near the first of July at Estevan and the seventeenth of July at North Battleford, adult flea beetles emerge from the soil and begin to feed on the leaves of leafy spurge. Female beetles lay 50 – 500 eggs in the soil near the base of leafy spurge stems. In 14 – 19 days the eggs hatch larvae, which burrow into soil, looking for first year roots. The larvae feed on roots until the fall. Older larvae feed on the outside of the older roots. During the winter, larvae move deeper in the soil where they spend the winter. With the arrival of spring, the larvae become active and again feed on roots. In June, the larvae pupate for one to eight weeks before becoming adults and emerging from the soil. Generally in Saskatchewan, the larvae feed on leafy spurge roots from late July to freeze-up and in the spring until early June. Beetles feed on the roots for 75 – 100 days when the temperature exceeds 9°C.

To understand the effectiveness of larvae feeding on the roots of leafy spurge, Kirby et al measured the loss of leafy spurge root weight after the release of flea beetles near Valley City, North Dakota (Journal of Range Management 2000 53: 305 – 308).



In 1988, black flea beetles were released on leafy spurge 15 km northwest of Valley City. The next year, black dot beetles were released on leafy spurge, 15 km southeast of Valley City. Starting in October of the beetle release year, a 12-cm diameter golf cup-cutter was used to obtain a 15-cm deep core of soil. Roots of leafy spurge were separated from the soil, dried and weighed. Root sampling was continued each year from 1988 to 1995.

From 1993 to 1995, the cover of leafy spurge on the soil was estimated at both sites and is presented in Figure 3 as percent leafy spurge foliage covering the soil surface. At one site, the pre-treatment leafy spurge foliar cover was estimated to be 45% of the soil surface.

Over the 7 to 8 years of the North Dakota study, there was a consistence reduction in the weight of leafy spurge roots in the top 15 cm of soil. The authors report that although the weight of the roots decreased within two to three years of the study, beneficial above ground changes occurred only after 5 years. What a person observes is beetles eating foliage of the weed and the cover of the foliage on the soil surface does not change for several years. While this is the observation, the beetle larvae are destroying the roots of the plant. So, don't be critical of beetle performance for at least 5 to 10 years after release.

After 7 to 8 years, Kirby reported that there were many buds on the roots of the weed and it could rapidly re-colonize without the continued presence of the flea beetles. Never do anything that will harm the beetles. During late June to early September always allow some above ground leafy spurge growth to feed the adults. When the foliage of leafy spurge has almost disappeared, it is time to credit the beetles with a job well done.

Dr. Garry Bowes is the Coordinator of the Noxious Weed Program (p 306.933.7695, f 306.933.7352, i gbowes@agr.gov.sk.ca). Financial support for The Noxious Weed Program has been provided by the Canadian Adaptation and Rural Development Fund in Saskatchewan (CARDS) and Agriculture Development Fund (ADF) to Saskatchewan Association of Rural Municipalities (SARM) in collaboration with Saskatchewan Agriculture, Food and Rural Revitalization (SAFRR). Funding for the CARDS Program is provided by Agriculture and Agri-Food Canada. ■

USDA - APHIS - PPQ
Bozeman, MT

Invasive Plants are a Rural-Urban Problem

Garry Bowes
Noxious Weed Program

Most Weed Inspectors are aware of the ongoing costs that noxious weeds, like scentless chamomile (*Matricaria perforata* Mérat) and leafy spurge (*Euphorbia esula* L.), have on agricultural areas in rural Saskatchewan. These plants are also considered to be invasive plants in native vegetation and are receiving more attention from those concerned about plant diversity in our environment. Rural Weed Inspectors have experienced the spread of noxious weeds from urban sites to rural areas through grain, machinery or other commodity movement. There are many reasons why urban residents, like rural residents, should be on the lookout for noxious weeds and be able to identify invasive plants that are not yet present in the province.

In Saskatchewan, invasive plants are called Invasive Exotic Species and in Canada, they are called Invasive Alien Species. These are plants that are non-native, or alien to the ecosystem under consideration, and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.

Weed Inspectors are aware of the on-going problems that noxious weeds can have on a community. There can be decreased land values, reduced stocking rates, reduced income from crops and/or increased costs for weed control. These are all threats to the quality of life of rural and urban residents alike in our province.

There are other undesirable invasive plants that could have a similar destructive influence of leafy spurge on the quality of life and environment of Saskatchewan residents. Four of these plants are: diffuse knapweed (*Centaurea diffusa* Lam.); spotted knapweed (*Centaurea stoebe* L. spp. *micranthos*); yellow starthistle (*Centaurea solstitialis* L.); and salt cedar (*Tamarix ramosissima* Ledebour and *T. chinensis* Loureiro). The knapweeds are designated as noxious weeds in Saskatchewan and have been found growing in isolated areas in the province. Starthistle and salt cedar are not yet known to grow in Saskatchewan. Owners or users of land in the province should looking for these invasive plants and reporting their exact location to local authorities.

Awareness of new invasive plants is generally low. This is what happened in the 1920s or 30s when leafy spurge and scentless chamomile first entered the province. Imagine the human effort, control costs and lost productivity that could have been saved if leafy spurge and scentless chamomile had been controlled when they first arrived. With ongoing scouting, control and monitoring for successful control, we have an opportunity to prevent new invasive plants from becoming major problems in the future.

During the introductory phase of a new invasive plant, there are many opportunities for the plant to enter a municipality. Human activities are known to move the plants from one location to another. The strategy of *Exclusion*, *Eradication* and *Containment* is effective for preventing the entrance of invasive plants to new sites, which become the source for local spread. This strategy should be practiced by everyone in the province.

Exclusion means isolating an invasive plant at far away locations, by diligently inspecting commodities or equipment coming from outside an area, and restricting the entry of contaminated material. *Eradication* is the reduction of a population of an invasive plant to zero. This is usually only effective and economical when invasive plants first arrive in your area and occupy small areas of land. *Containment* is keeping a weed population within a specific area. If *Exclusion* fails, then it is important to *Eradicate* the new weed as soon as it is discovered. If *Eradication* goals become unrealistic, then the invasive plants should be *Contained* to prevent spread throughout the province.

An opportunity for an invasive plant to establish occurs when a seed germinates on a preferred site (Table 1). The number and type of preferred sites are many, often greater in urban than rural areas, and disturbance plays a critical role in invasive plant establishment. Agricultural land, acreages, industrial lands and parks as well as urban yards are suitable sites for invasion by non-native plants. This is why *Exclusion* is so important for keeping highly invasive plants from establishing themselves in Saskatchewan.

Many invasive plants have many common characteristics (Table 1). These plants are not native to North America, are distributed over a large area of the United States, and some can be found in Canada. They also have the ability to proliferate over a wide range of climatic conditions from dry to wet and hot to cold.

The annual rates of spread for the five invasive plants listed in Table 1 are comparable. To put rate of spread in perspective, think of your bank account with an annual rate of interest of 25%! Ongoing control may be needed for years for eradication programs to be successful. This is best done under the leadership of proactive Weed Inspectors.

A characteristic of invasive plants that make them so devastating is their ability to gain dominance over native vegetation (Table 1). All five plants listed in Table 1 can invade and replace native plants. This is why the *Exclusion*, *Eradication* and *Containment* strategy to control and prevent invasive plant spread is so important to land managers. These plants reduce grazing for livestock (cattle) and reduce the use of native habitat by wildlife. Yellow starthistle is toxic to horses.

In Saskatchewan, urban and rural residents have experienced periods of drought. Diffuse knapweed, spotted knapweed and yellow starthistle are known to reduce soil moisture reserves (Table 1). Salt cedar has an extensive root system that resists erosion more than most native riparian plants that grow in the south-western part of the United States. The water channel narrows, flow rate increases and water depth increases. Also, water use rates by salt cedar are among the highest of any phreatophyte (A deep-rooted plant that obtains water from a permanent ground supply) evaluated in south-western area.

Invasive plants can impact human health (Table 1). The latex in leafy spurge is toxic, the pollen from knapweeds is allergenic and yellow starthistle causes mechanical injury from spines on the seed head. Sap from the knapweeds may also irritate bare skin when the weed is pulled. These plants are unwanted in urban as well as rural areas.

Invasive plants are not just a rural problem, they are everyone's problem. Joint activities between rural and urban municipalities to control and prevent invasive plant spread are mutually beneficial. For addition information on these weeds,

TABLE 1 COMPARISON OF THE UNDESIRABLE TRAITS OF FIVE INVASIVE PLANTS*

	Leafy Spurge	Spotted and Diffuse	Yellow Starthistle Knapweed	Salt Cedar (or Tamarisk)
Distribution	• 30 US states and 6 provinces and 3 - 5 provinces	• 24 -47 US states	• 41 US states	• 14 - 19 US states
Preferred Sites	• Abandoned cropland • Pastures • Rangeland • Woodland • Roadsides • Waste areas habitats	• Semiarid disturbed sites • Undisturbed native plant communities	• Open grasslands • Deep,well-drained soils	• Floodplains • Riparian habitats • Springs • Rights-of-ways • Residential areas • Parks
Annual Rate of Spread	• 12% – 16%	• 10% - 24%	• 13% - 17%	• 1.3% - 25%
Impact on:				
Plant Community	• Native species production reduced 70 to 80%	• Invade undisturbed native bunchgrass communities	• Displaces native plants	• Displaces native plants
Livestock	• Cattle avoid	• Unpalatable to mammalian herbivores	• Spines damage eyes, nose and mouth • Toxic to horses	
Wildlife	• Habitat utilization reduced reduced		Habitat utilization replaced	Native riparian habitat
Soil and Water		• Reduce water infiltration and increase runoff	• Reduces soil moisture reserves	• Increases soil salinity • Roots stabilize stream channels, restrict channel width and increase water flow • High water use
Human Health	• Toxic substance	• Powerful air-borne allergen	• Mechanical injury	
Economic	• $120 million/year in ND, SD, MT and WY	• $26 million potential loss to western Canada • $156 million potential loss to MT	• $12.5 million annual management cost in CA	• Projected loss of $7 – 16 billion over the next 55 years

* *Information on invasive species characteristics is from the book: Invasive Plants of Range and Wildlands and Their Environmental, Economic, and Societal Impacts by C. L. Duncan and J. K. Clark, 2005.*

including photographs to help with identification, use Google with images on the internet (type in the scientific name of the plant).

Dr. Garry Bowes is the Coordinator of the Noxious Weed Program (p 306.933.7695, f 306.933.7352, e gbowes@agr.gov.sk.ca). Financial support for The Noxious Weed Program has been provided by the Canadian Adaptation and Rural Development Fund in Saskatchewan (CARDS) and Agriculture Development Fund (ADF) to Saskatchewan Association of Rural Municipalities (SARM) in collaboration with Saskatchewan Agriculture, Food and Rural Revitalization (SAFRR). Funding for the CARDS Program is provided by Agriculture and Agri-Food Canada. ■

Leafy Spurge Control with Flea Beetles, Sheep and Herbicides

Garry Bowes
Noxious Weed Program

Choosing the most appropriate method for the control of leafy spurge is often a difficult decision for Weed Inspectors. This article compares the use of biological control agents, herbicides and sheep for the long term control of leafy spurge.

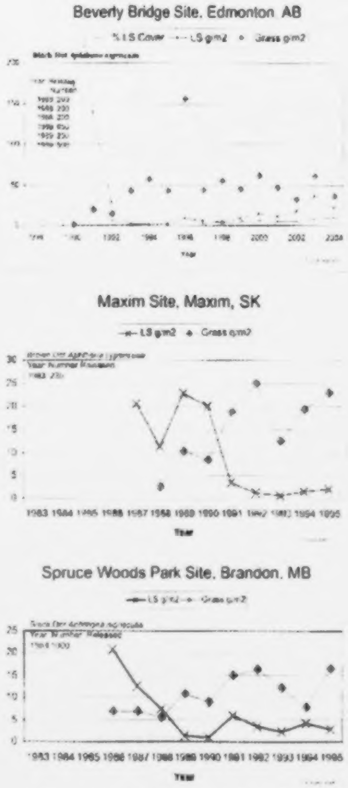
Leafy spurge is an invasive plant in Saskatchewan that was most likely introduced many times from Europe and Asia. It is a noxious weed that gradually gains dominance on abandoned land, native grasslands, tame forage stands and land with woody vegetation. Extensive lateral and deep horizontal roots give the plant a competitive advantage. Leafy spurge is a prolific seed producer and the seed can remain viable in soil for at least eight years. Once leafy spurge invades a site and seed drops on the soil, the noxious weed is very difficult to eradicate.

Biological control is the deliberate use of a weed's "natural enemies" to suppress its population and then the "natural enemies" maintain a low weed population density. In Europe and Asia, flea beetles are natural enemies of leafy spurge. They were collected in their native habitat and found to feed on leafy spurge and not on closely related economically important spurges (poinsettia). Since 1978, five flea beetles species have been released in Canada. The black dot (*Aphthona nigriscutis*), brown dot (*A. cyparissiae*) and black (*A. lacertosa*) flea beetles cause the most damage to the weed.

Adult beetles feed on the leaves of leafy spurge and the larvae feed on young roots. Root feeding creates wounds on roots that allow native soil pathogens to enter the roots and cause additional damage. The greatest stress on leafy spurge is caused by root-feeding larvae.

Land owners are often unhappy with the degree of weed control (or population suppression) that occurs after beetles are released on leafy spurge. Long term data on leafy spurge suppression following the release of beetles has been collected on three sites on the prairies. This information provides an indication on what can be expected after beetles are released.

At the Beverly Bridge site near Edmonton, AB, beetles were released in 1988 and 1989 on leafy spurge that was growing on the south facing slope (Figure 1). From 1991 to 1992 the weight of leafy spurge growing on the site dropped drastically. The population suppression was attributed to the beetles. If you start to count in 1988, it took five years from the year that the first beetles were released until the leafy spurge population was suppressed.


Beverly Bridge Site, Edmonton AB

Maxim Site, Maxim, SK

Spruce Woods Park Site, Brandon, MB

Figure 1: Leafy Spurge Release Sites

At the Maxim Site, near Maxim, SK, it took nine years from first beetle release until the leafy spurge population was suppressed.

At the Spruce Woods Park Site, it took seven years from first beetle release until leafy spurge was suppressed.

A comparison of the three sites showed the time from beetle release until the leafy spurge was suppressed varied from five to nine years. At the Beverly Bridge and the Maxim sites leafy spurge suppression was quick whereas at the Spruce Woods Park Site the suppression occurred over three years. At all of the sites, once the suppression occurred, the above ground weight of leafy spurge remained at a low level but the weed was always present. The weight of grass was always greater than the weight of leafy spurge.

On release sites in Saskatchewan where the beetles have established, leafy spurge is usually present and the weed often sets some seed.

At Mortlach, SK, continuous grazing by sheep was used to control leafy spurge (Figure 2). Sheep willingly graze leafy spurge once they acquire a taste for the weed. Starting when the sheep first enter the pasture, it took four years of grazing before the shoots of leafy spurge were reduced to a low number. As long as sheep remained on the pasture to graze leafy spurge, the weed was always present but at a low number of shoots per square meter. While the weed was present, the flowers were continuously consumed by the sheep and seed was not set. For successful control with sheep, the number of sheep must be sufficient to graze leafy spurge.

At a site 22 km east of Regina, SK, Tordon 22K® was used at the recommended rate of 3.6 L/acre to control leafy spurge (Figure 3). Picloram the active ingredient in Tordon 22K kills or damages leafy spurge and can persist in an active form in the soil for several years. Separate experiments were started in 1965, 1966 and 1967. One year after treatment the weed almost disappear. Depending on the year that the experiment was started, leafy spurge returned three, four or five years after treatment and needed to be retreated with a herbicide. Often for long term control on large areas with leafy spurge the use of a herbicide is cost prohibitive.

The control method selected by a Weed Inspector depends on the resources available and the conditions present on a site with leafy spurge. Weed Inspectors should plan to control the weed for at least ten years.

If a herbicide is selected as the control method then ask the question: Are repeated treatments affordable and is it environmentally safe to use a herbicide?

If sheep are selected then is the land owner prepared to rent sheep, start raising sheep, adjust the grazing rate for sheep from year to year and/or keep sheep grazing leafy spurge for a long time?

If beetles are selected then will the lands owner make multiple collections and releases over several years? It is possible the beetles may not establish and perform adequately on sandy soils, overflow or sub-irrigated range sites, leafy spurge growing under shrubby vegetation and riparian areas.

There is no best control method for leafy spurge. Often a Weed Inspector will select a control method that is compromised by what a land owner is willing to do for many years. This review of expected long term control or weed suppression shows the advantage that leafy spurge flea beetles have over herbicides and sheep grazing. Beetles provide cost effective, labour free, long term suppression of leafy spurge for large areas. Land owners should make every effort to establish the flea beetles on leafy spurge. This means making multiple collections and releases over several years.

Figure 2: Leafy Spurge Control with Sheep

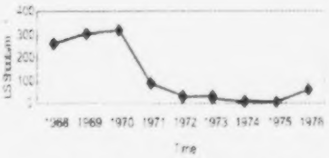
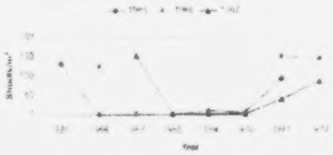


Figure 3 Leafy Spurge Control with Tordon 22K



* *Trademark of Dow AgroSciences LLC*

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Weed Seed Viability in Manure, Silage and Compost

By Dr. Garry Bowes, Noxious Weed Program

Available information suggests that some seeds of some weeds will remain viable following ensiling, passing through a rumen and storage in manure. Spreading non-composted manure can introduce weed seeds to a field and encourage weed spread to new areas in the province.

Prevention is the best method to keep viable weed seeds from being spread on fields with manure. Be aware of the many ways that weed seeds can travel from livestock feed to your field.

Weeds seeds can enter livestock feed in forages, grain and pelletized feed products. Scout standing forage crops for unwanted weeds early in the growing season. Whenever possible always control unwanted weeds. Do not harvest forage crops with weeds that have maturing seed. Analyze grain samples for unwanted weed seeds and when present do not purchase. According to Cash et al., in a review by Katovich et al., there is even a danger when using pelletized feed products because 'less than 1% of the weed seed survives feed grinding and pelletizing'; implying that some seeds survive the process. Even one seed of a weed that you don't have is too many.

The most dangerous viable weed seeds are those that are foreign to your fields. Do not use livestock feeds that are known to contain: 1) noxious weed seeds, 2) seeds from alien plants that do not grow in Saskatchewan and/or 3) seeds from aggressive spreading plants that grow in a few small areas of the province.

Proper composting produces an organic by-product that is free of viable weed seeds (Table 1).

Table I Viable weed seeds in livestock systems

Article	Number of Weeds	Number of weed species with viable seed					
		Rumen	Silo	Silo & Rumen	Manure	Rumen & Manure	Compost
Atkenson et al. 1934	12					4	
Blackshaw and Rode 1991	12	9	7	7			
Eghball and Leosing 2000	8						0[1]
Maryland Ext. Bull. 1908	52				0		
Maryland Ext. Bull. 1908	21				0		
Stoker et al 1934	3				1		
Wiese et al 1998	5						0[2]

[1] Moisture added to manure and manure turned

[2] Temperature was at least 82 C (180 F) for 7 days, manure with 35% moisture

The viability of seeds as they pass through hay/silage to a cow's rumen to short term manure storage is generally not known for many specific weeds. Available information on seed viability for some weeds as they pass through livestock systems was reviewed by Katovich et al. of the University of Minnesota Extension Service (Table 1). Their review showed that it is not safe to rely on the cattle rumen, ensilage or manure storage to devitalise all weed seeds.

Ensiling kills some to many weed seeds (Table 1). Some of the weed seeds in animal feed will pass through an animal's digestive tract. Weed seeds introduced in animal bedding bypass the animal all together and directly enters the manure. Some viable weed seeds will pass through any combination of silage, rumen digestion and/or manure handling. In general, grass weed seeds are more likely to be killed by ensiling or rumen digestion than broadleaf weeds. The most difficult broadleaf weed seeds to be killed are those with hard seed coats. Unfortunately the dreaded noxious perennial weed field bindweed, has a hard seed coat and is less likely to be killed by rumen digestion than other weeds. This hard seed coat also contributes to a potential long life to field bindweed seeds in soil – up to 50 years!

Composting is the biological decomposition of organic matter which is accomplished in two stages: an active stage and a curing stage.

In the active stage, micro-organisms feed on manure. They consume oxygen while producing carbon dioxide, heat and water vapour. For effective composting proper temperature (50 – 60 C), moisture content (50 – 60%) and aeration (oxygen >5%) must be maintained. This is accomplished by timely turning (aerating) and adding moisture to manure containing noxious weed seeds.

In the curing stage, the microbial activity slows down and the organic by-product approaches ambient air temperature. At the end of the curing stage, the organic by-product can be spread on fields without fear of adding viable noxious weed seeds to the soil. For more detailed information on composting, obtain a copy of the Mature Composting Manual, available on-line from Alberta Agriculture, Food and Rural Development.

According to the Mature Composting Manual, composting temperatures ranging between 45 and 65 C are needed for more than two weeks to ensure seed viability is destroyed. According to an article by Katovich et al., temperatures between 71 and 82 C (160 and 180 F) for longer than two week are required to kill hard coated seeds from weeds like field bindweed.

To minimize environmental problems, such as manure odours, some animal operations use anaerobic manure digestion. The biological process composts manure under anaerobic condition (low oxygen) in a digestion container. Temperatures in anaerobic digester are well below the temperature that is required to kill most weed seeds.

Composting animal manure using the traditional method of maintaining proper aeration, moisture content, and temperature is the best way to ensure that viable weed seeds are not put on soil with manure. After manure is composted the piles of organic matter should be protected from the introduction of new sources of weed seeds.

When weeds, like field bindweed, are known to be in manure, scout the field after the composting by-product has been applied to ensure the composting process is adequate to kill the hard coated seeds.

REFERENCES

Cash, S.D., D.L. Zamora and A.W. Lessen. 1998. J. Range Manage 52:181-185.

Katovich, E.J., R.L. Becker and J. Doll. Date unknown. Weed seed survival in anaerobic digesters. Available from the University of Minnesota Extension Service.

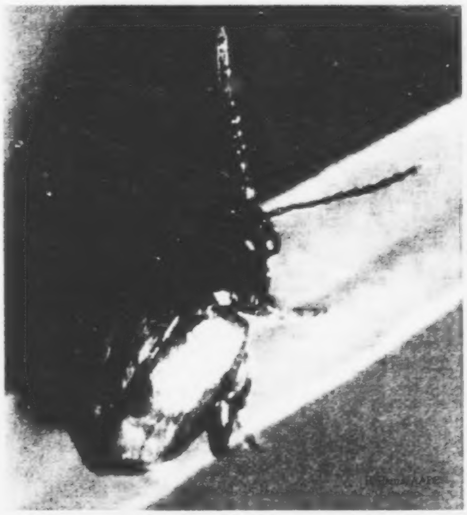
Dr. Garry Bowes is the Coordinator of the Noxious Weed Program (p 306.933.7695. f 306.933.7352. i gbowes@agr.gov.sk.ca). Financial support for The Noxious Weed Program has been provided by the Canadian Adaptation and Rural Development Fund in Saskatchewan (CARDS) and Agriculture Development Fund (ADF) to Saskatchewan Association of Rural Municipalities (SARM) in collaboration with Saskatchewan Agriculture and Food (SAF). Funding for the CARDS Program is provided by Agriculture and Agri-Food Canada. ■

Let Research Answer Your Questions

Recent scientific research articles contain information that can answer some of the questions that are often asked by Weed Inspectors.

1. How well is biological control working?

2. Will viable leafy spurge seed pass through the digestive tract of sheep?



Black Dot Spurge Flea Beetle (*Aphthona nigriscutis*)

Release 1000^+ beetles per release point

Coarse dry to very dry soils

Soil warmed by direction (south) or lack of ground cover

Spurge density $<60/m^2$

Black Spurge Flea Beetle (*Aphthona lacertosa*)

Release 1000^+ beetles per release point

Moist loam to clay soils

Competing vegetation taller than leafy spurge

Will Viable Seed of Leafy Spurge Pass Through the Digestive Tract of Sheep?

At Montana State University, sheep were fed leafy spurge seeds at the soft dough, hard dough and mature stages of development. Manure was collected every 24 hours. Seeds were recovered, counted and tested for germination.

In the field, leafy spurge seeds do not mature at the same time. Soft dough seeds collected on June 24th contained 25% mature seed. Hard dough seeds collected on July 19th contained 80% mature seed. Mature seeds collected on August 10th were 100% mature.

Seeds in the soft dough stage did not germinate and were nonviable. Some seeds in the hard dough and mature stages were viable. More seeds from the mature stage (3.8%) than soft (0.2%) and hard dough (1.5%) stages were recovered from manure.

Stage of Leafy Spurge Fed to Sheep	Days After Feeding	Immature Seeds	Mature Seeds	% Germinated of Mature Seeds*
Soft Dough Stage	1	7	2	0
• Seed is immature and capsules were easily cut by fingernail	2	[illegible]	1	[illegible]
	3	2	1	0
• 0.2% of the fed seed was recovered	4	0	0	0
	5	0	1	0
Hard Dough Stage	1	4	16	41
• Most capsules were hard and difficult to cut by fingernail	2	1	7	0
	3	0	3	0
• 1.5% of the fed seed was recovered	4	1	2	10
	5	0	0	0
Mature Seed	1	0	24	81
• 3.8% of the fed seed was recovered	2	0	71	36
	3	0	10	0
	4	0	3	0
	5	0	1	0

* Viable seed will germinate in the future

Conclusion and Recommendation: Sheep pass a small percentage of viable seed through their digestive tracts. Do not move sheep until all leafy spurge viable seeds have passed, conservatively 4 – 5 days.

Adapted from B.E. Olson and R.T. Wallander JRM 2002 Vol. 55: 65-69

Recovery of Leafy Spurge Seed from Sheep

In south western Montana, Targhee sheep were twice rotated through paddocks that contained leafy spurge.

Fresh manure was collected 4, 10 and 14 days after sheep entered a paddock. The manure was dried and washed over sieves to recover leafy spurge seeds. The seeds were counted and tested for germination.

Manure collected per animal per day contained seeds during the June 17th, July 14th and July 29th grazing periods. The number of viable seed excreted daily per animal ranged between 0 and 17.

The percentage of viable seeds collected from manure was always lower than for seeds collected directly from leafy spurge.

Seeds of leafy spurge that are consumed and passed through the digestive tract may enhance the dispersal of the weed.

Leafy Spurge Seed Recovered from Manure of Sheep

Date	Seeds/ Animal/Day	Viable Seeds
Sheep entered paddock June 27th		
30 June	41	0
8 July	88	9
13 July	46	0
Sheep entered paddock July 14th		
17 July	144	7
25 July	114	17
Sheep entered paddock July 29th		
31 July	41	8
8 Aug	41	0

In October, the sheep were shorn and seeds were recovered from the fleeces.

Leafy Spurge Seed Recovered from Fleeces

Sheep Number	Fleece wt. kg	Seeds in Fleece
1	2.7	0
2	2.6	129
3	2.7	0
4	2.7	29
5	3.1	0
6	2.4	74

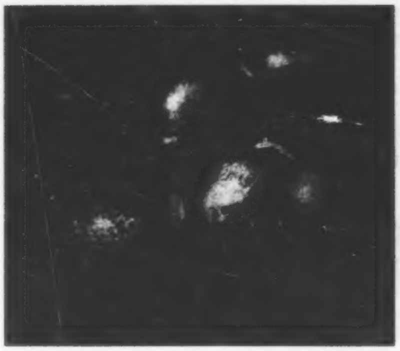
Sheep grazing leafy spurge during a grazing season will pick up seeds in their fleece.

Three fleeces contained leafy spurge seeds and three did not. The authors believed that the crimped nature of wool would cause seeds to adhere to the wool fibres and become embedded. Seed may drop before becoming embedded but once embedded, seeds would most likely fall out during shearing and processing.

Conclusion: When using sheep to control leafy spurge, graze the weed before seed set. If leafy spurge has set seed, do not move sheep from infested areas to uninfested areas unless the animals are confined for 5 days.

Adapted from B.E. Olson, R.T. Wallander and R.T Knott. 1997 JRM 50: 10-15

USDA



Leafy Spurge Suppression with Flea Beetles

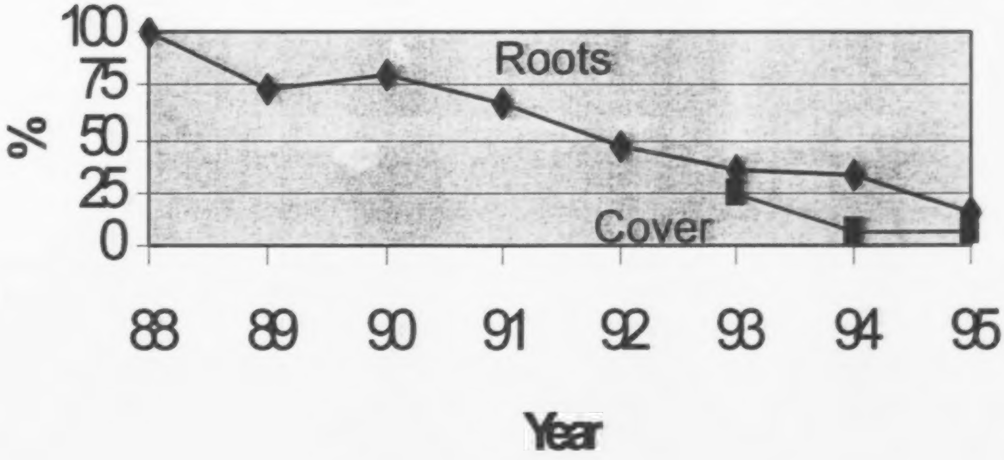
Leafy spurge flea beetles (*Aphthona* spp.) control the weed by suppression. This experiment in east central North Dakota shows how flea beetles released at two sites gradually reduced leafy spurge root weight and foliage cover.

At the first site, flea beetles were released in 1988 and at the second site in 1989.

The soil was a silty clay. Each October, the weight of roots was obtained by using a golf-cup cutter to sample a soil core 15-cm deep in the soil. Leafy spurge roots were separated from the soil, dried and weighed. The cover of leafy spurge foliage was measured at haying time.

Figure 1 shows the loss of root weight by the flea beetles as % loss from the first sample. The reduction in the cover of leafy spurge foliage is expressed as a percent of a nearby patch of leafy spurge where the flea beetles were not found.

Figure 1 % Loss of Root Weight and Foliage Cover After Flea Beetle Release



Conclusions:

- There was a gradual loss of root weight over 7 to 8 years
- After 7 to 8 years, 16% of the roots were alive
- Beneficial foliage cover reduction did not occur until 5 years after insect release
- After 7 to 8 years, leafy spurge foliage covered 6 to 7% of the soil surface

Be patient, effective biological control takes a long time

Dr. Kirby, Professor, Animal and Range Sciences Department, North Dakota State University writes: 'The results of this study should not be interpreted too broadly'.

He goes on to say: "*Aphthona* spp. (Leafy spurge flea beetle) establishment in sandy soils, overflow or subirrigated range sites and in shrubby or riparian areas have not been successful to date".

For successful beetle establishment select sites with silty clay soil that are not close to flowing water or in a mixed leafy spurge – shrubby vegetation community.

Adapted from an article by Kirby et al 2000 JRM 52: 305-308

A leafy spurge site in the province with established black dot and black flea beetles. The beetles are doing a good job of suppressing leafy spurge in the flood plain except along the stream bank.

Healthy leafy spurge plants are growing along the stream bank

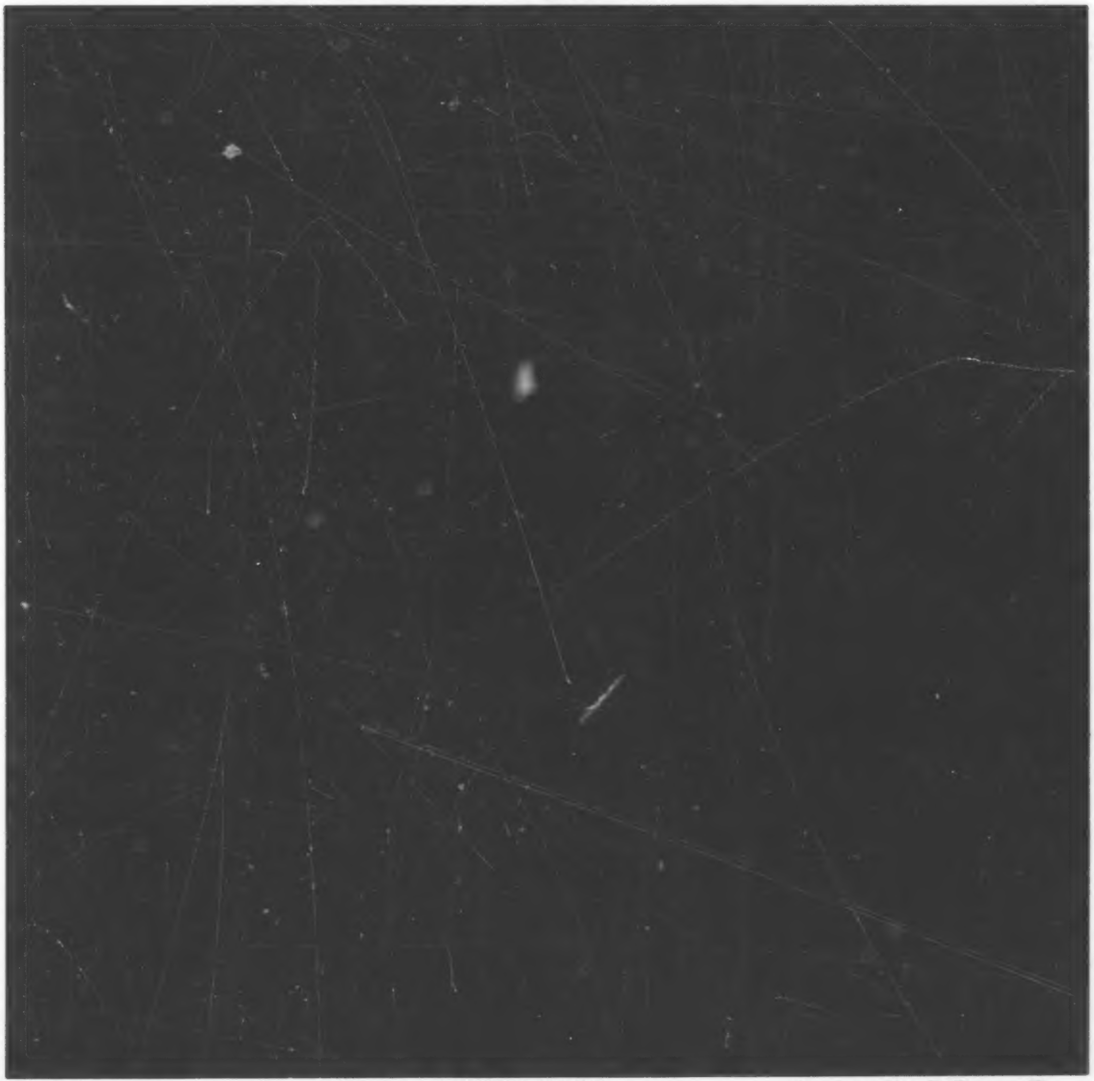
Biological Control of Leafy Spurge with Beetles

In two separate experiments, black dot and black flea beetles were released on medium density stands (~40 stem/m^2) of leafy spurge.

Beetles were collected and released on the same day. The average sand-silt-clay was 44-37-19 at the black dot flea beetle release sites and ranged from 11:67:22 to 50:38:12 at the black flea beetle release sites.

Each year stem density was counted, compared to stem density at nearby sites with no beetles and tabulated as percent stem decline. Each year during peak beetle emergence, the adults were collected in a sweep net (38 cm diameter sweep net), counted and presented as leafy spurge flea beetle number per sweep (LSB #/sw).

Black Dot Flea Beetle Sites



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Black Dot Flea Beetle Sites

The number of black dot flea beetles increased from the first year after release to the second year after release, and then remained constant but relatively low to the fifth year after release.

Notice the gradual decline of leafy spurge stems the second year from the release point to 16 m. Also, stems declined from the second to the fifth year at 4 to 16 m.

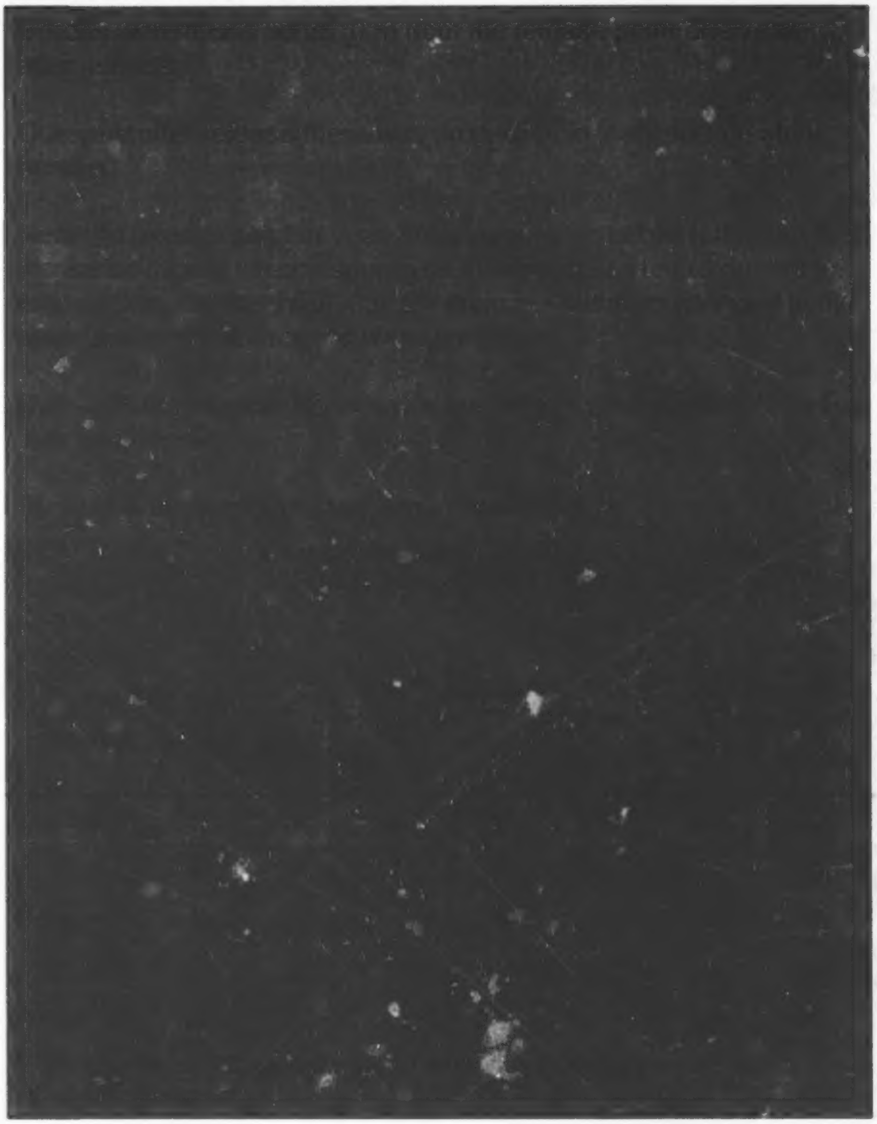
By the fifth year, the decline of leafy spurge ranged from 50 to 70%. In a more recent paper (2002), the same authors reported that once control reached an average of 65% stem reduction that neither leafy spurge control or the beetle population increased during the next 5 years.

In North Dakota, black dot flea beetles are present in every county but there are very few location where their number exceed 5 to 10 beetles per sweep.

Distance from Release Point (metres)	Years After Black Dot Flea Beetle (*Aphthona nigriscutis*) Release								
	1	2		3		4		5	
	LSB #/sw	LSB #/sw	% Stem Decline	LSB #/sw	% Stem Decline	LSB #/sw	% Stem Decline	LSB #/sw	% Stem Decline
Pole			62		64		58		72
0 to 4	1	5	62	7	64	4	58	7	82
4 to 8	4	7	26	7	54	7	58	4	72
8 to 12	3	5	17	1	22	6	[illegible]	5	51
12 to 16	1	2	12	5	23	4	33	6	57

LSB #/sw = Leafy Spurge Beetle Number per Sweep with a 38 cm diameter sweep net.

Black Flea Beetle Sites



Conclusions

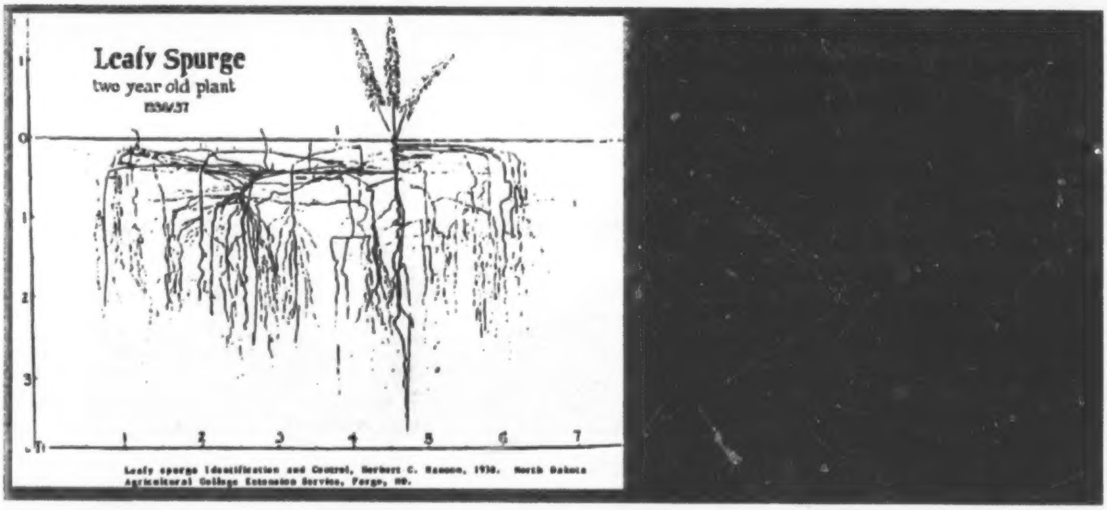
In this study black dot flea beetles reduced the stem density of leafy spurge to ~65% but the number of beetles per sweep was always low.

Black flea beetles reduced the stem density of leafy spurge to 95% or better and number of beetles per sweep was high but varied from year to year.

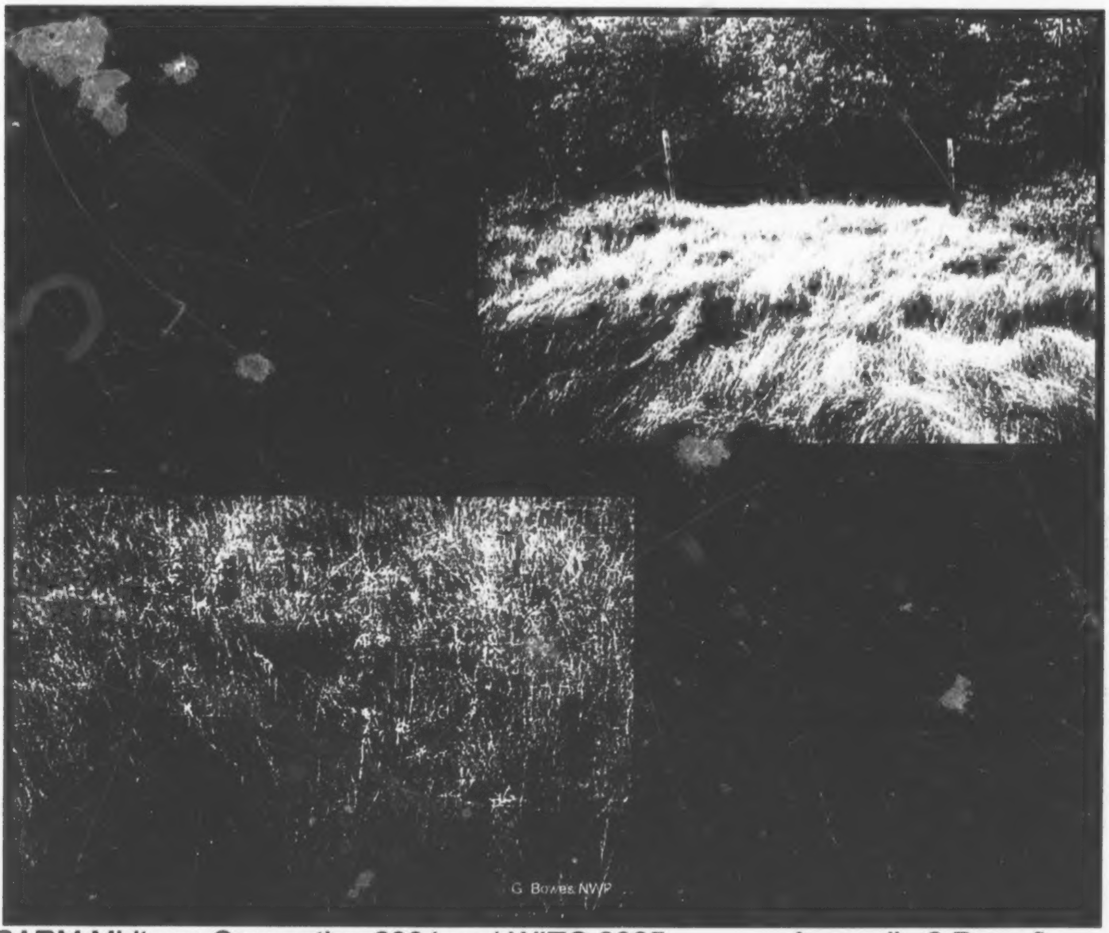
It is important to sample release sites each year and around the time the adults are expected to emerge to find the best time to collect high numbers.

Adapted from Lym and Nelson 2000 Weed Technology 14: 642-646

How Does Leafy Spurge Grow


Leafy Spurge
two year old plant
1936/37
1
0
1
2
3
1
2
3
4
5
6
7

Leafy spurge Identification and Control, Herbert C. Hanson, 1938. North Dakota Agricultural College Extension Service, Fargo, ND.



G. Bowes NWP

Black Flea Beetle Sites

Beetles were found up to 10 m from the release point one year after release.

One year after release there was no decline in leafy spurge stem number.

Near the release point in year 2, the population of black flea beetles increased rapidly. Leafy spurge stem number started to decrease in year 2 and by the third year after release the percentage of leafy spurge stems that declined was impressive.

By year 3 the number beetles per sweep was similar, within 20 m of the release pole.

By year 4, leafy spurge stem reduction was 95% or better.

Distance from release Pole (metres)	Years After Black Flea Beetle (*Aphthona lacertosa/czwalinae*) Release						
	1	2		3		4	
	LSB #/sw	LSB #/sw	% Stem Decline	LSB #/sw	% Stem Decline	LSB #/sw	% Stem Decline
Pole	8	96	51	14	95	102	98
0 to 5	4	103	11	36	91	109	100
5 to 10	1	14		29	61	50	98
10 to 15	0	3		23	36	56	98
15 to 20	0	2		20	37	56	95

LSB #/sw = Leafy Spurge Beetle Number per Sweep with a 38 cm diameter sweep net

Conclusions

In this study black dot flea beetles reduced the stem density of leafy spurge to ~65% but the number of beetles per sweep was always low.

Black flea beetles reduced the stem density of leafy spurge to 95% or better and number of beetles per sweep was high but varied from year to year.

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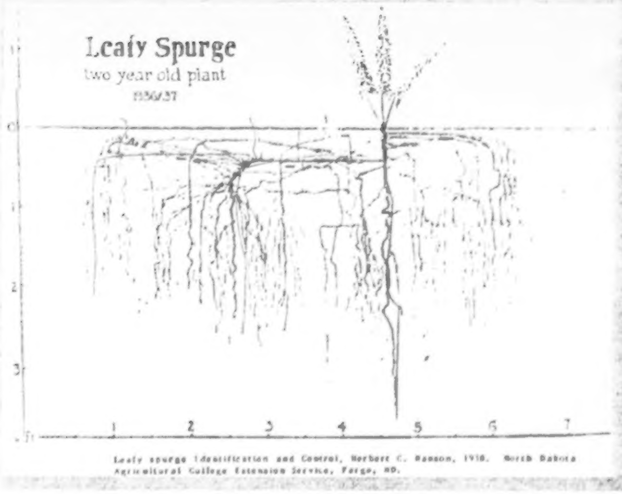
How Does Leafy Spurge Grow

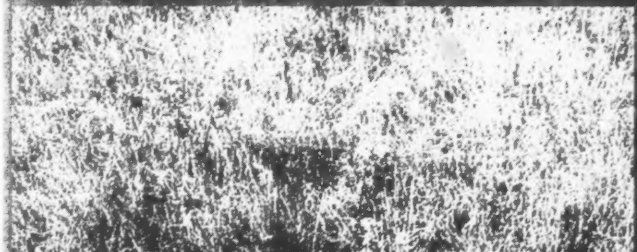


Leafy spurge Identification and Control, Herbert C. Hanson, 1938. North Dakota Agricultural College Extension Service, Fargo, ND.

A two-year old plant has a small amount of above ground growth and a massive root system.

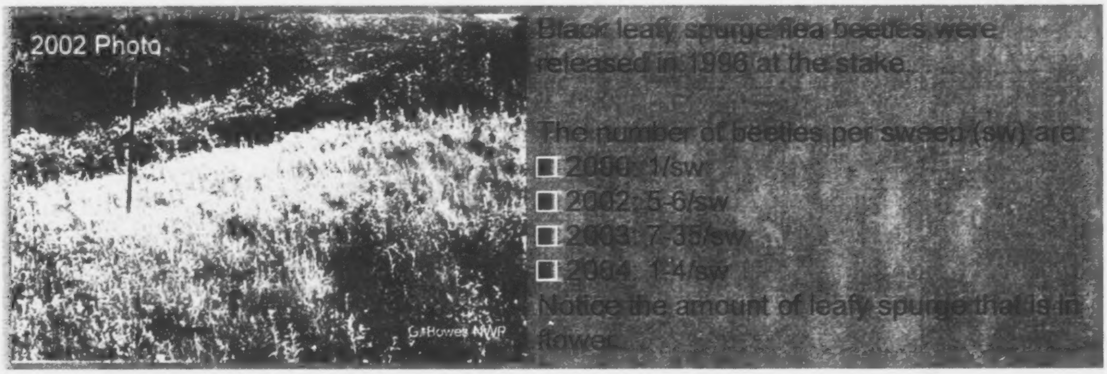
After a seed germinates, a seedling grows deep into the soil (red line). Above ground, leafy spurge does not usually flower the first year. Then a lateral root grows first horizontally and then deep into the soil (green line). From the lateral root (green line), a new root (blue line) or shoot (orange line) can grow.

G. Bowes NWP



G. Bowes NWP

Part 1: Long Term Control of Leafy Spurge with Flea Beetles



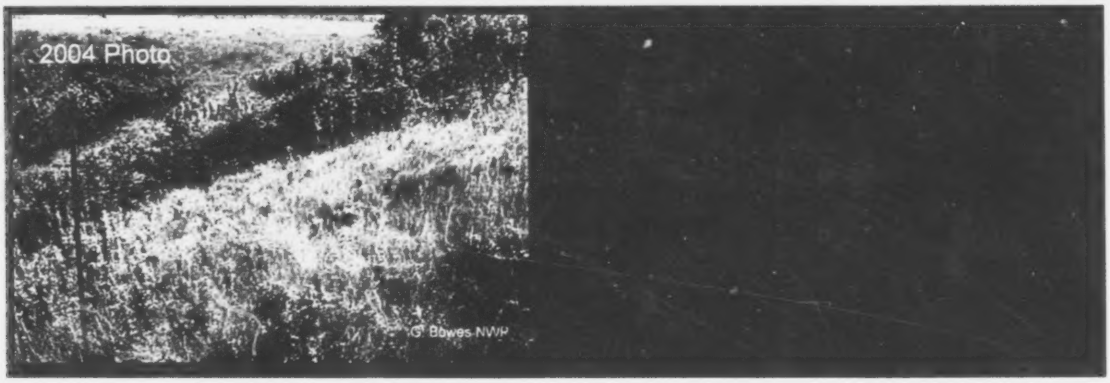
Black leafy spurge flea beetles were released in 1996 at the stake.

The number of beetles per sweep (sw) are:
- ☐ 2000: 1/sw
- ☐ 2002: 5-6/sw
- ☐ 2003: 7-35/sw
- ☐ 2004: 1-4/sw

Notice the amount of leafy spurge that is in flower.

2003 Photo
G. Bowes NWP

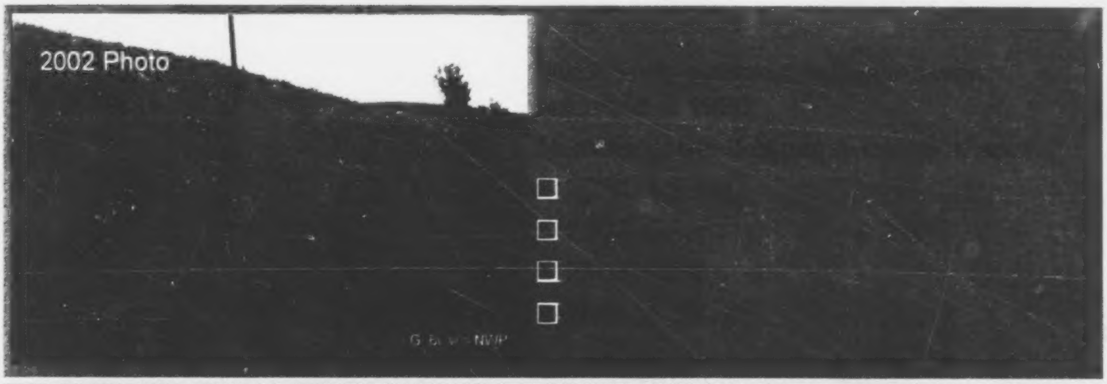
[illegible]



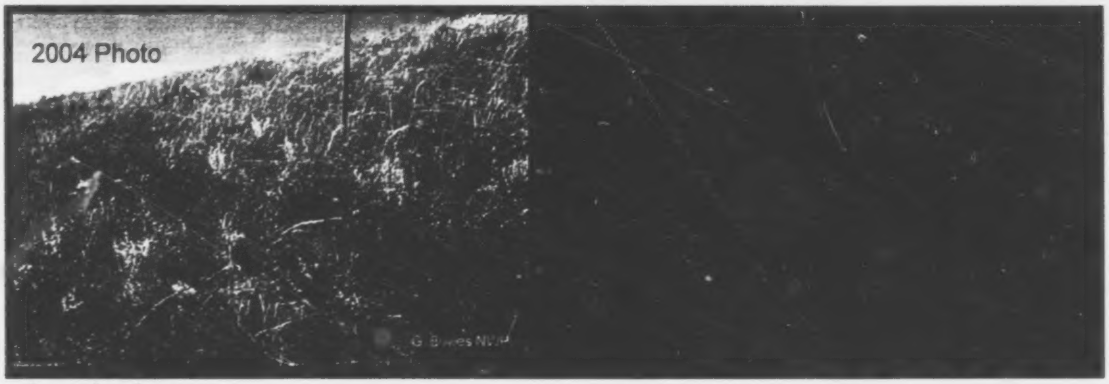
Conclusion

On this site, the best time to capture beetles for release at a new site was in 2003. Adult beetle emergence is staggered, so on warm sunny days, start sampling around the first of July for the best collection day. Sweep for beetles during the warmest part of the day. Collect for release when the number per sweep is high.

Part 2: Long Term Control of Leafy Spurge with Flea Beetles



2003 Photo
G. Bowes NWP



Conclusion

Biological control agents like the flea beetles never eradicate leafy spurge. As the food supply (leafy spurge) dwindles, a small number of beetles will be present on the remaining stems. The few stems that are visible in 2004 Photo may have originated from roots that were not consumed by the larval stage of the beetles or seed. As the number of leafy spurge stems increases, the number of beetles will increase. Over time, the number of leafy spurge stems will fluctuate around an equilibrium that depends on the intensity of the beetle attack and the ability of leafy spurge to survive the attack. The equilibrium will fluctuate with environmental conditions.

Part 1: Long Term Control of Leafy Spurge with Flea Beetles

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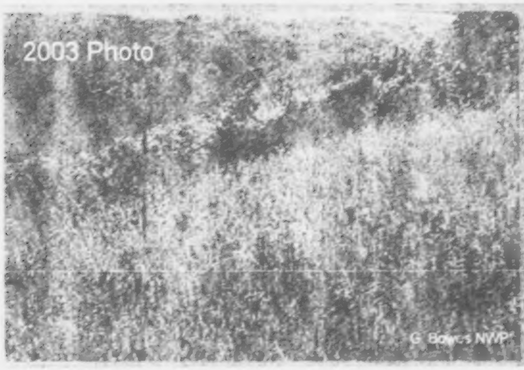

In 2003, there were fewer leafy spurge stems than in 2002 and only a few stems flowered. There is very little yellow in 2003 Photo.

In 2004, only a few stems of leafy spurge appeared and only a few of these stems flowered and set seed.

Conclusion

On this site, the best time to capture beetles for release at a new site was in 2003. Adult beetle emergence is staggered, so on warm sunny days, start sampling around the first of July for the best collection day. Sweep for beetles during the warmest part of the day. Collect for release when the number per sweep is high.

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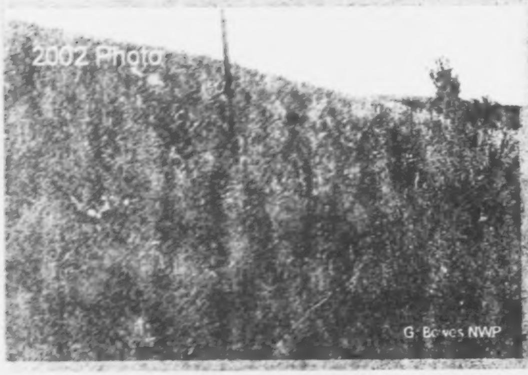


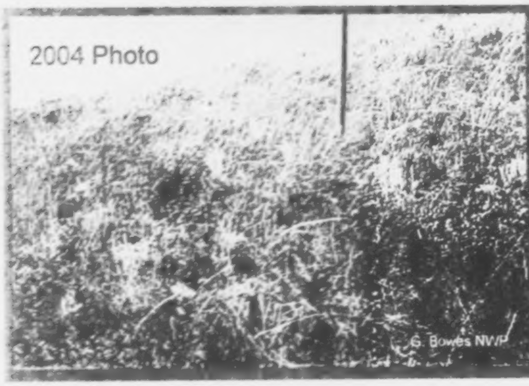
Black leafy spurge flea beetles were released in 1998.

Number of beetles per sweep (sw) are:

- 2000: <1/sw
- 2002: 0/sw
- 2003: 0/sw
- 2004: 1-3/sw

2003 Photo
G. Bowes NWP

In 2000, several small stems of leafy spurge were found. 2002 Photo and 2003 Photo show that no leafy spurge stems were found near the release point at the stake.



[illegible]

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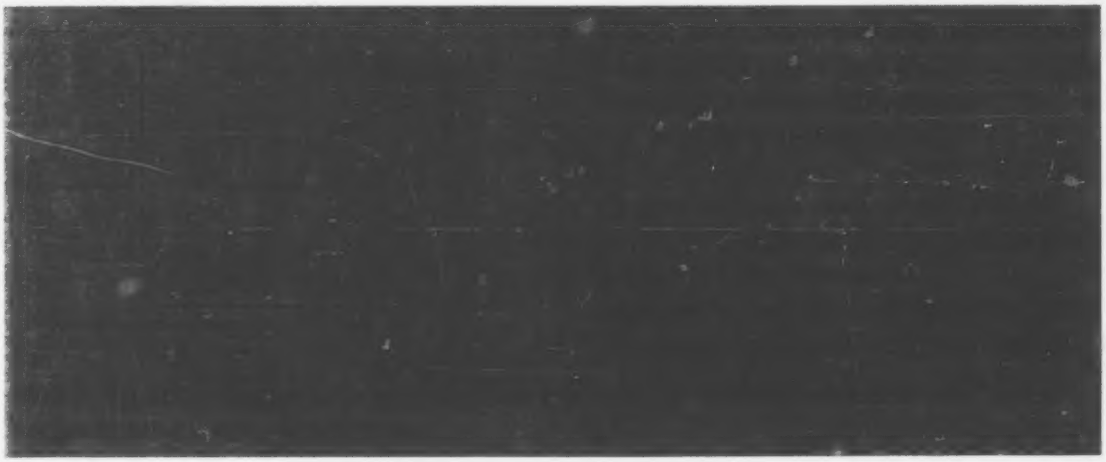
A site in the province with leafy spurge. Notice the continuous infestation of leafy spurge along the road right-of-way and the large patches in the nearby grasslands. An example of a site where there is rapid expansion (colonization) of leafy spurge. Always control small patches of leafy spurge with herbicides when they first appear in your area to prevent a large infestation from happening.

Why Every Municipality Needs a Proactive Weed Inspector

To successfully eradicate or adequately control our worst weeds, they must be found when they first establish. Our worst weeds are declared noxious under the Noxious Weed Act. A Weed Inspector has the authority to enforce control.

A proactive Weed Inspector has the opportunity to eradicate a noxious weed when it is found growing in a small area for only a few years. The fewer the number of seeds in the soil, the better the opportunity for eradication.

When a reactive Weed Inspector reacts to a complaint of noxious weed, it is often found growing in a large area for many years. The only option is ongoing yearly control. Control is difficult because for many of the worst weeds, seeds can remain viable in soil for a long time.



When the invasive plant is declared noxious, it falls under the Noxious Weed Act. Land owners are obligated to control the weed and Weed Inspectors enforce the act.

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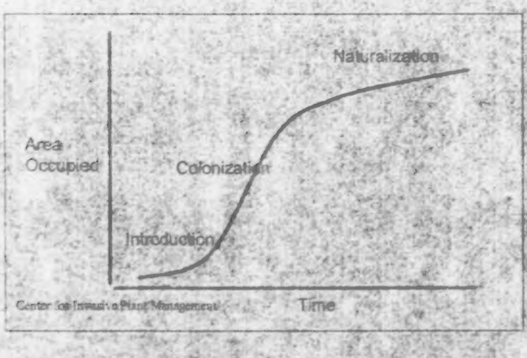


When an invasive plant is **Introduced** to an area it takes time for its occupied area to increase. This is the opportunity for eradication.

Colonization is when there is rapid expansion of the area occupied by the plant. Eradication is next to impossible and the only opportunity is for containment and long time control.

When a plant occupies a large area then it is most likely **Naturalized** and will grow as part of the native vegetation.

When the invasive plant is declared noxious, it falls under the Noxious Weed Act. Land owners are obligated to control the weed and Weed Inspectors enforce the act.

Always Appoint a Weed Inspector to Stop Weed Spread

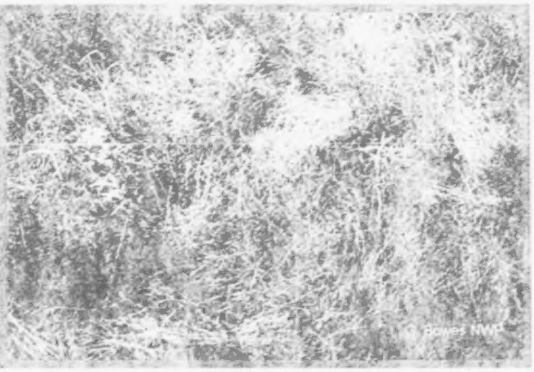
A successful Weed Inspector is proactive. He always looks for new infestations of noxious weeds like leafy spurge and makes plans to eradicate, when possible. Eradication is difficult. The best opportunity for successful eradication occurs when a weed is growing in a small patch for only a few years.

A single leafy spurge stem looks like a seedling. Usually, one year old seedlings do not flower.

This is the best time to start an eradication program because there has been no seed rain. Isolated leafy spurge stems are almost impossible to find.

The leafy spurge stems (one is flowering) looks like a two-year old or older plant. All of the stems could be connected by a massive root system.

Single flowering stems of leafy spurge can be spotted by a proactive Weed Inspector when walking. Most likely the weed with one flower will be missed when a Weed Inspector is scouting with a vehicle.



The flowering leafy spurge stem [illegible] like a three- to four-year old or older pla[illegible]

Leafy spurge [illegible] [illegible] years before [illegible] aggressive lateral root growth starts [illegible] the patch.

When eradication is started for a two-to-three year old leafy spurge patch, viable seed will have fallen on the soil. Because leafy spurge seed can remain viable in the soil for at least 8 years, a 10-year control program using a residual herbicide is recommended.

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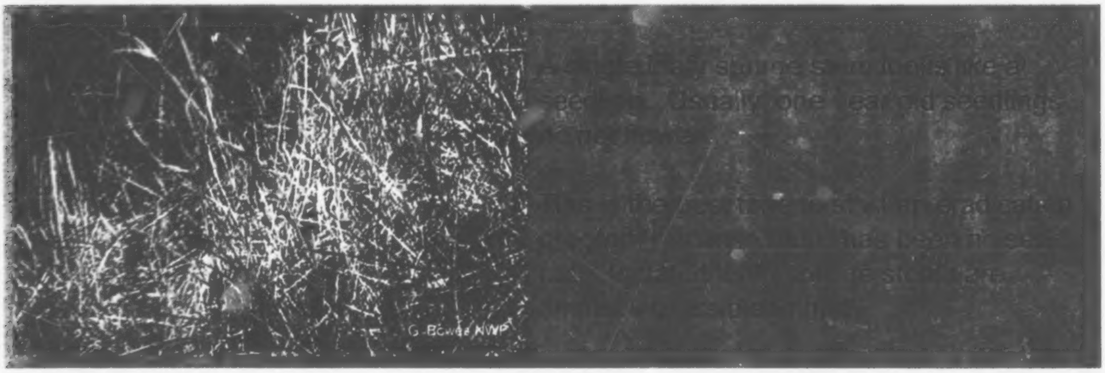
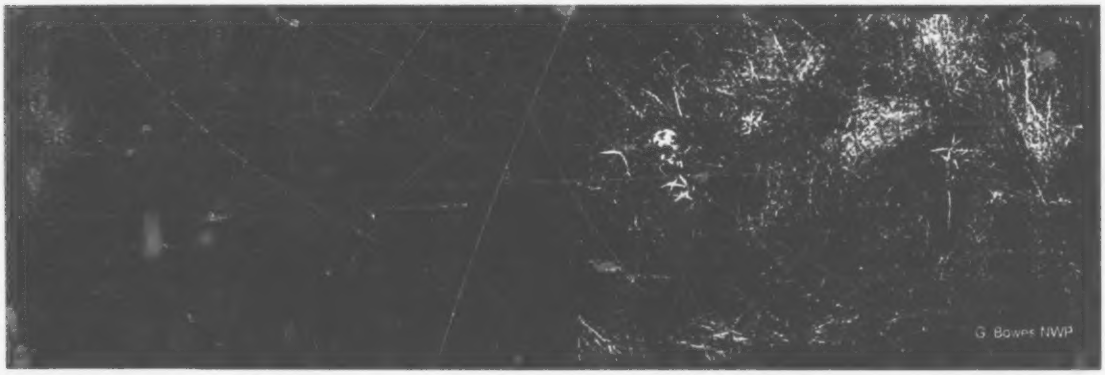


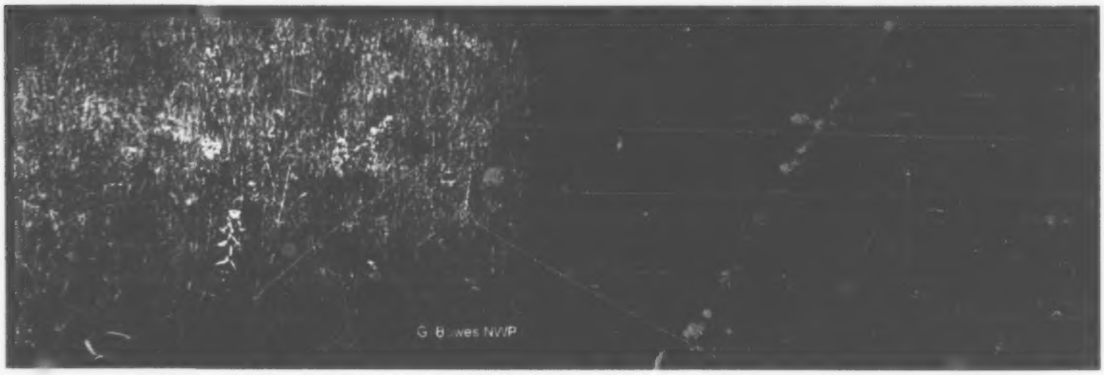
G. Bowes NWP

A [illegible] leafy spurge stem looks like a seedling. Usually one year old seedlings [illegible]

This is the best time to start an eradication [illegible] has been in seed [illegible] stems are [illegible]



G. Bowes NWP



G. Bowes NWP

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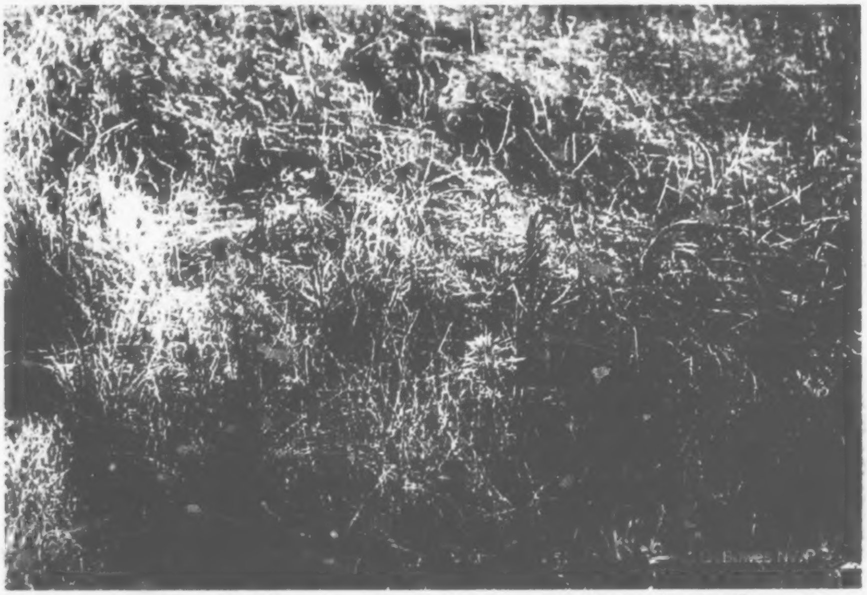
Leafy Spurge in the Fall

Fall can be a good time to scout for leafy spurge because some of stems are crimson red and easy to spot.

G. Bowes, NWP

There is a tendency for leafy spurge to remain upright in the fall as the surrounding grasses lay on the ground.



G. Bowes NWP

Fall is a good time to scout for leafy spurge

The Conflict Between Agricultural Activities and Biological Control

In 1993 seed weevils and 1999 gall midges were introduced from Europe for the biological control of scentless chamomile. These biological control agents will only eat scentless chamomile. For the agent to be successful, scentless chamomile must always be present.

Scentless chamomile grows in disturbed areas, which are found in road right-of-ways, drainage ditches, fence lines, cropland, pastures, farmyards and waste areas. The noxious weed grows in rural and urban communities.

In disturbed sites, scentless chamomile grows in low, moderate or high densities. When the surrounding vegetation is dominated by a healthy grass stand, particularly brome, a patch of scentless chamomile will disappear in 3 to 5 years. If a grass stand is subsequently disturbed and there is seed in the soil, then there is a good chance that some scentless chamomile plants will appear.

Every time an agricultural activity disturbs an area with established grasses, forbs and scentless chamomile, the weed can either be controlled or a better habitat is created for the weed's growth. Multiple tillage can give good control whereas a single tillage can improve the weed's habitat. The dilemma for Weed Inspectors is; the biological control agent can only survive and increase when scentless chamomile is present. When scentless chamomile sets seed there can be an opportunity for spread.

Suitable Sites for Scentless Chamomile Seed Weevil and Gall Midge Release

For the seed weevil and gall midge populations to increase, scentless chamomile plants must go through their natural growth cycle each year for many years.

Old gravel pits, landfill sites and rock piles are good sites for the seed weevil and gall midge numbers to increase (Figure 1 Top, Middle Bottom).

Select sites (Figure 1) where there is minimal risk for spread by seed. Flowing water is high risk for seed spread. Use a herbicide for weed control along roadsides in a landfill to prevent seed from moving on vehicles and footwear (Figure 1 Middle).

When the risk of spread is high use herbicides rather than biological control agents.

Seed weevils can travel 2.7 km/year and gall midges can travel 5.2 km/year.

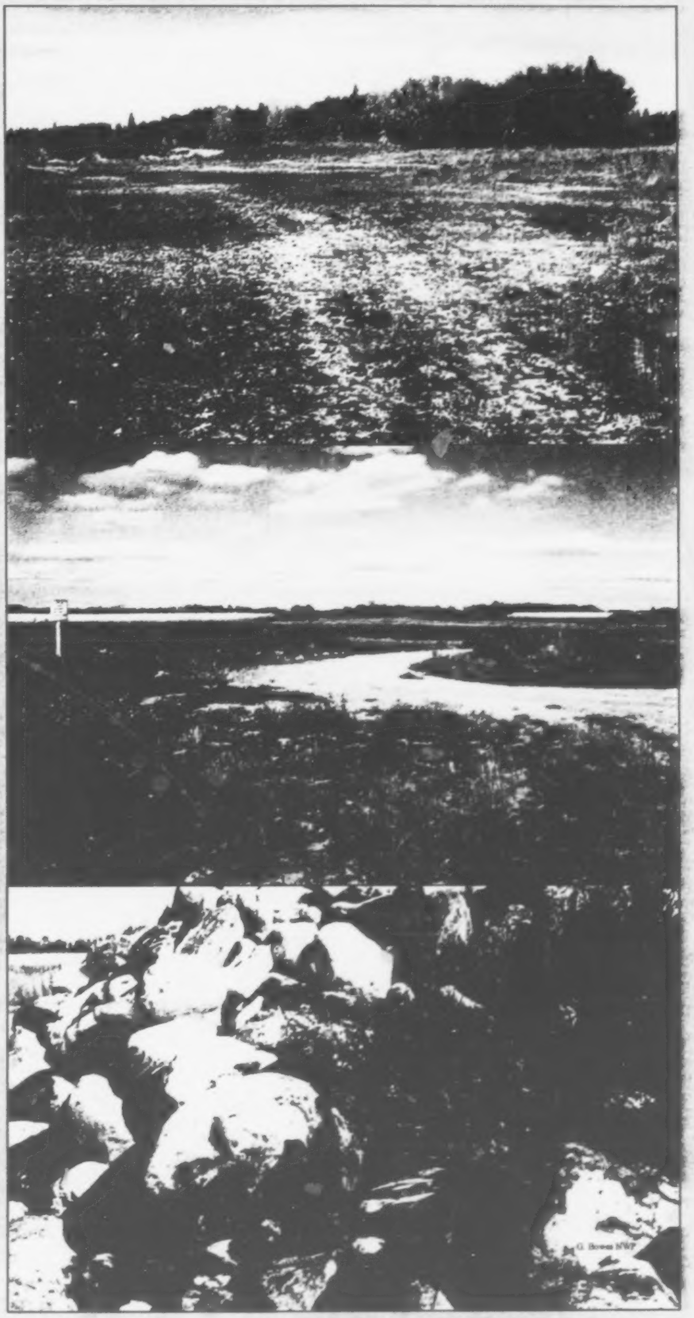


Figure 1 Old gravel pit (Top), landfill site (Middle) and rock pile (Bottom)

Mowing Kills Scentless Chamomile Seed Weevils

The life cycle of the seed weevil is completed in the flower-seed head of the noxious weed. When flower buds first open in the spring, adult seed weevils lay eggs in the flower bud (Figure 1 Top A). The eggs hatch a larvae, which eat florets as they develop into seed. The larvae pupate and immature adults begin to appear as the colour of the flower changes from brownish-yellow to brown (Figure 1 Top B).

Figure 1 (Middle) shows scentless chamomile plants with seed weevils growing on one side of a fence and a mowed area on the other side of the fence. The area was mowed for weed control.

Figure 1 (Bottom) shows the rapid increase in weevil numbers in 1999 and 2000 when scentless chamomile was not mowed, and low weevil number once mowing started in 2001.

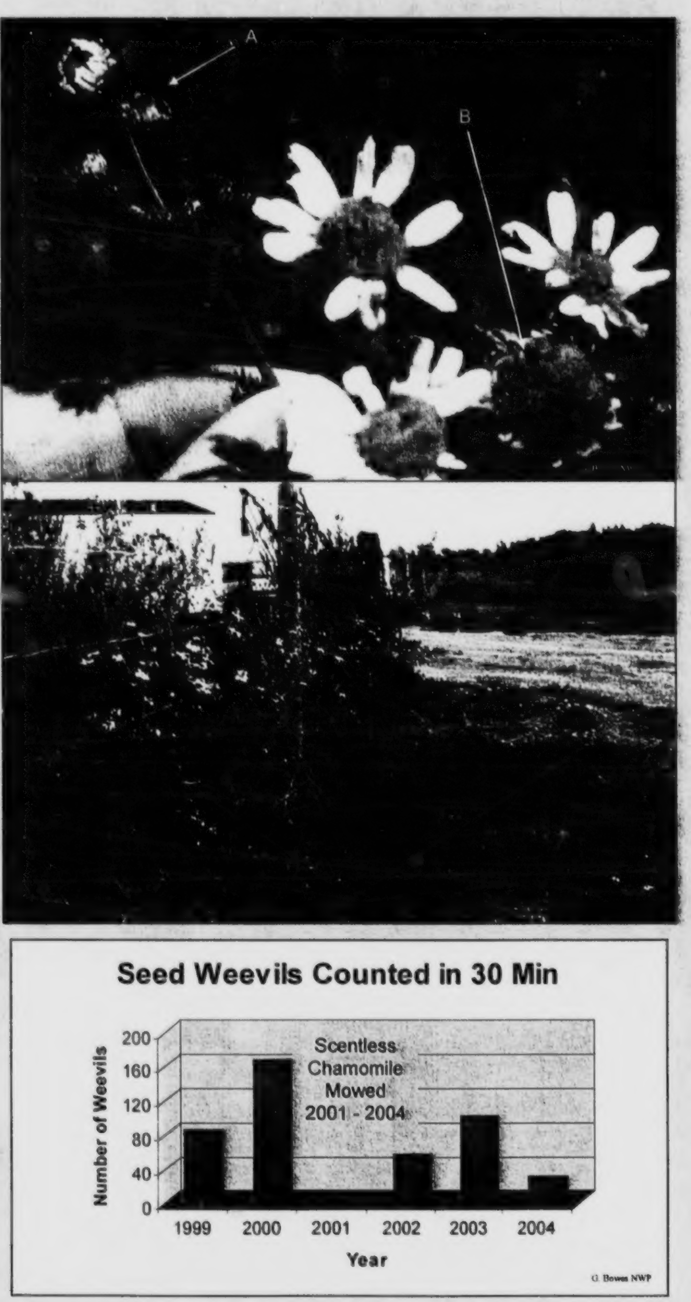


Figure 1 Seed weevils laying eggs (Top A) young adults are found in brownish-yellow flower heads (Top B), weevils are destroyed by mowing (Middle) and weevil number remain low after mowing (Bottom)

Mowing Kills Scentless Chamomile Gall Midges

In the fall, gall midges attack rosettes of scentless chamomile and over winter in galls (Figure 1 Top Left). The galls are bright green in the fall (Figure 1 Top Left) and range from crimson red to green in the spring (Figure 1 Top Right). Adult gall midges emerge in the spring and attack rapidly growing stems (Figure 1 Middle). It appears that after the adults emerge in July, flowering stems grow near or from the gall and produce seed (Figure 1 Bottom).

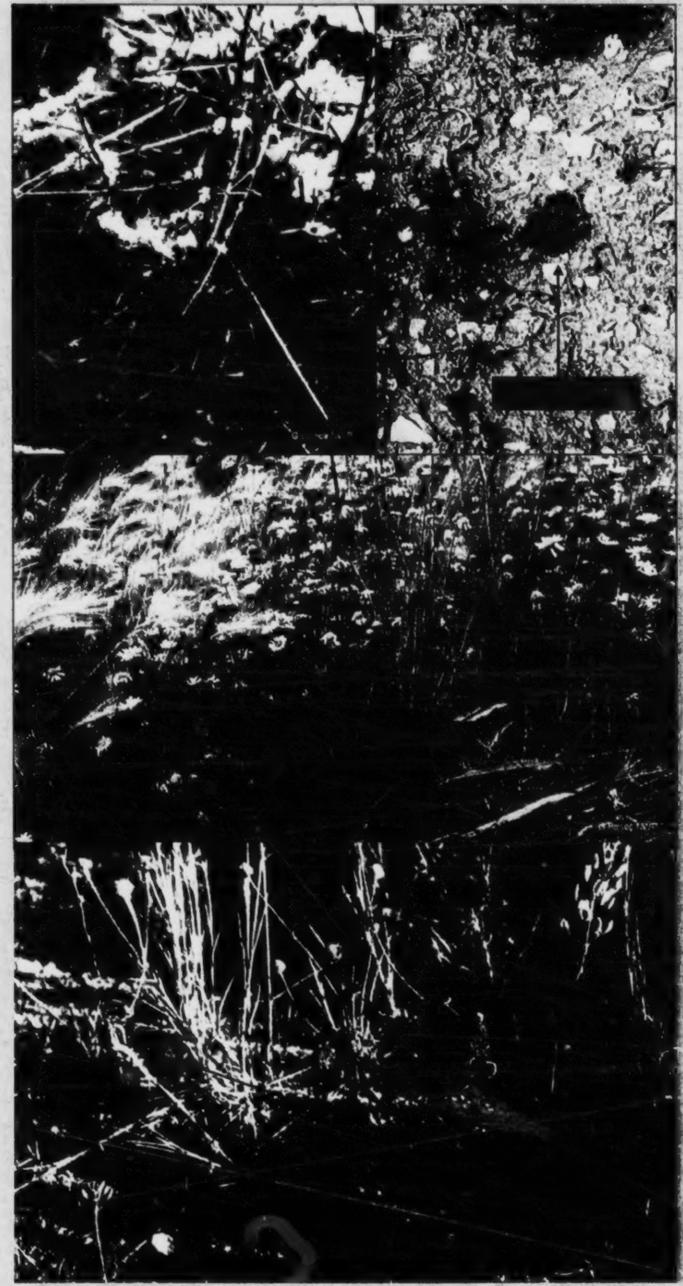


Figure 1 Galls formed by the Scentless Chamomile Gall Midge in the fall (Top Left), in the spring (Top Right), during June (Middle) and on a mature dead plant (Bottom)

Mowing in June will kill midges in the galls on the stems of scentless chamomile (Figure 1 Middle).

Release gall midges in sites that will not be mowed. Let the gall midges travel to mowed sites and attack plants that are missed by mowing. Gall midges can travel up to 5.2 km/year.

Healthy Stands of Grass for Scentless Chamomile Control

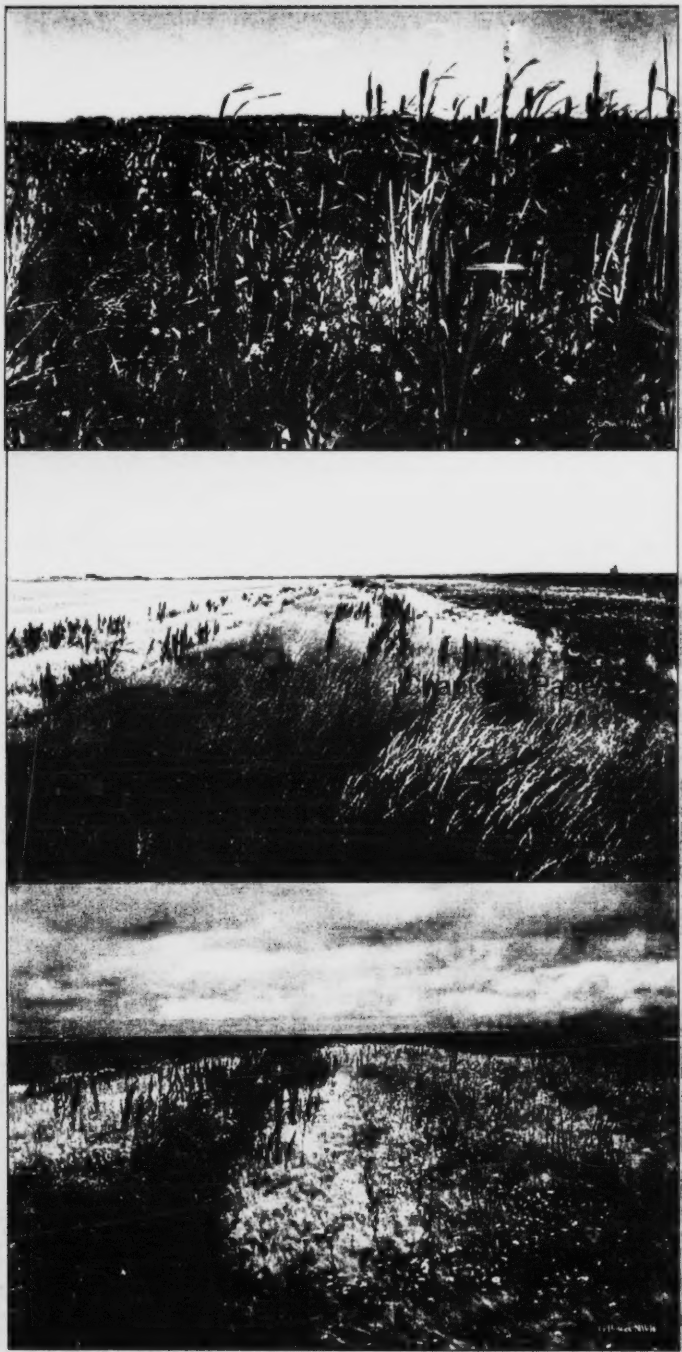


Figure 1 Scentless Chamomile growing near a slough (Top), in a drainage ditch in 2001 with a good grass stand (Middle) and in 2004 after the grass stand was broken in the drainage ditch (Bottom)

Scentless Chamomile is able to grow next to cattails (Figure 1 Top). This site is too wet for grasses to establish and compete with the weed.

Permanent grass stands will prevent scentless chamomile from establishing. Figure 1 (Middle) shows a healthy stand of grass growing along a drainage ditch, which is known to have seeds of scentless chamomile in the soil. Sometime between 2001 and 2004 the grasses area was farmed. During 2004, which was wet, the drainage area was not farmed and became weedy (Figure 1 Bottom). One of the prominent weeds is scentless chamomile. On water seed can remain buoyant for up to 12 hours and can germinate.

A good method for scentless chamomile control growing in wet-moist areas is to seed grass and leave the areas in grass during droughts. Part of a site can be to wet for grasses to establish.

Control of Scentless Chamomile in High Risk Areas

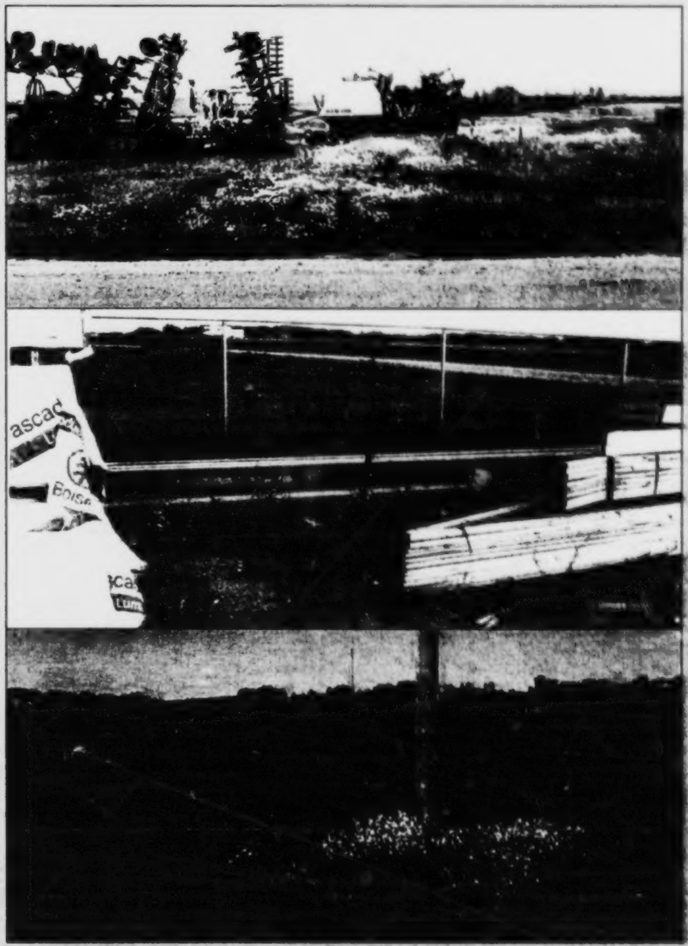


Figure 1 Scentless chamomile growing in the equipment yard of a farm implement dealer (Top), in the yard of a lumber dealer (Middle) and around a utility pole (Bottom)

Disturbed vegetation is a preferred habitat for the growth of scentless chamomile.

Examples of sites where there is an opportunity for on-going vegetation disturbance are a farm machinery storage yard, a lumber yard and near a utility pole (Figure 1 Top, Middle and Bottom).

If there is an on-going disturbance of vegetation and scentless chamomile has grown on the site, then scout the site each year during June for the weed.

These sites can be controlled with a herbicide applied with a back pack sprayer. Apply the herbicide up to flowering to ensure that the weed does not set seed. Monitor for treatment effectiveness and retreat when necessary.

The area around utility poles can be seeded to a perennial grass and treated with a herbicide when the adjacent field is treated for the weed. Several weeks after treatment, monitor for herbicide treatment effectiveness. Retreat when necessary to prevent seed set.

Scentless Chamomile Growing in Disturbed Vegetation

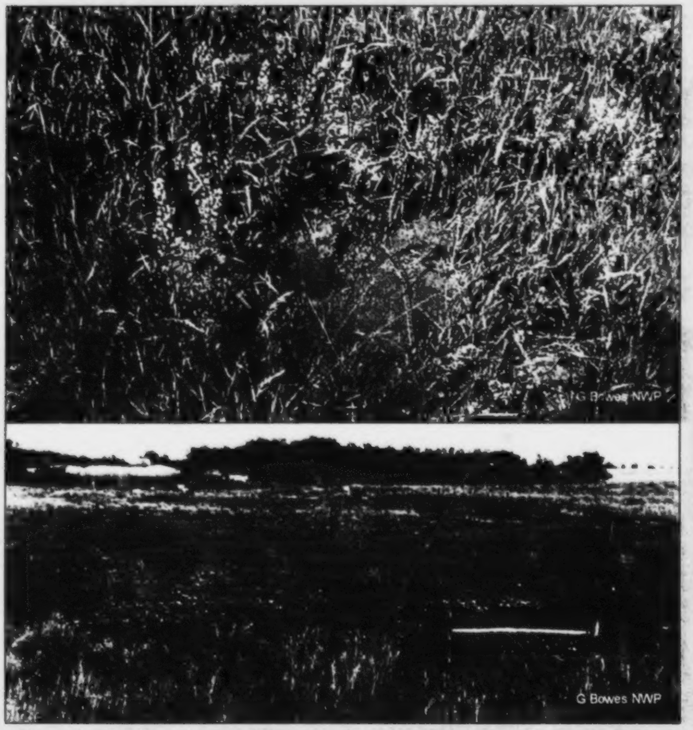


Figure 1 Scentless chamomile growing in a soil mound made by a burrowing animal (Top) and in a heavily grazed pasture (Bottom)

Figure 1 shows two permanent grass stands. One stand is not grazed but there are soil mounds from burrowing animals (Figure 1 Top). Plants of scentless chamomile establish on the soil mounds each year until the surrounding grasses invades. This can only happen when there is seed in the soil, which germinates and a plant establishes.

At a site similar to the one shown in Figure 1 (Top), in a 30-minute search for seed weevils, 23 were found in 2002 and 115 were found in 2004. In non-mowed grasslands, it appears that as long as soil mounds are made each year by burrowing animals and scentless chamomile grows and sets seed, seed weevils will survive and consume a portion of the seed set. Soil mounds made by burrowing animals provide the disturbed site that is needed by scentless chamomile.

When a pasture is heavily grazed and bare soil is exposed, there is an opportunity for scentless chamomile plants to establish Figure 1 Bottom). The arrow shows bare soil and scentless chamomile plants.

On sites, which are disturbed each year and scentless chamomile grows, seed weevils will consume a portion of the weed's seed.

Scentless Chamomile Seed Weevil Release Sites Near Cultivated Fields

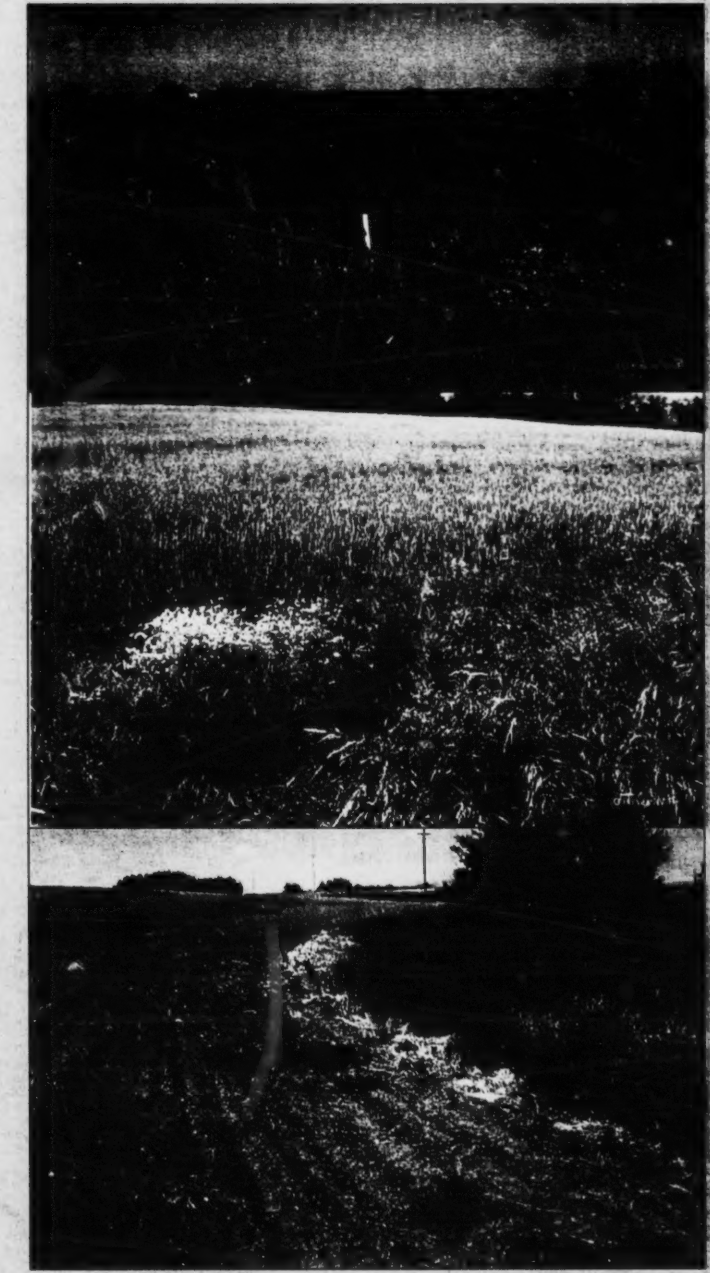


Figure 1 Scentless chamomile seed weevil release site at the red stake (Top), seed weevils on plants at the edge of a field (Middle) and seed weevils killed by cultivation (Bottom)

Three different release sites show why seed weevil populations are low near cultivated fields (Figure 1 Top, Middle and Bottom). Seed weevils were released near the red stake in 1995. By 2002, grasses had invaded the release site. To survive the weevils must move to plants growing far away.

Sometimes the only place that scentless chamomile plants can grow is along the edge of a field (Figure 1 Middle).

Cultivation kills some of the scentless chamomile and the seed weevils that live in the flower-seed heads (Figure 1 Bottom).

For control of scentless chamomile at the edge of a field use herbicides to kill the weed and prevent spread. The edge of a cultivated field is not a good site for seed weevil release.

Problems Associated with the Use of a Mower to Control Scentless Chamomile

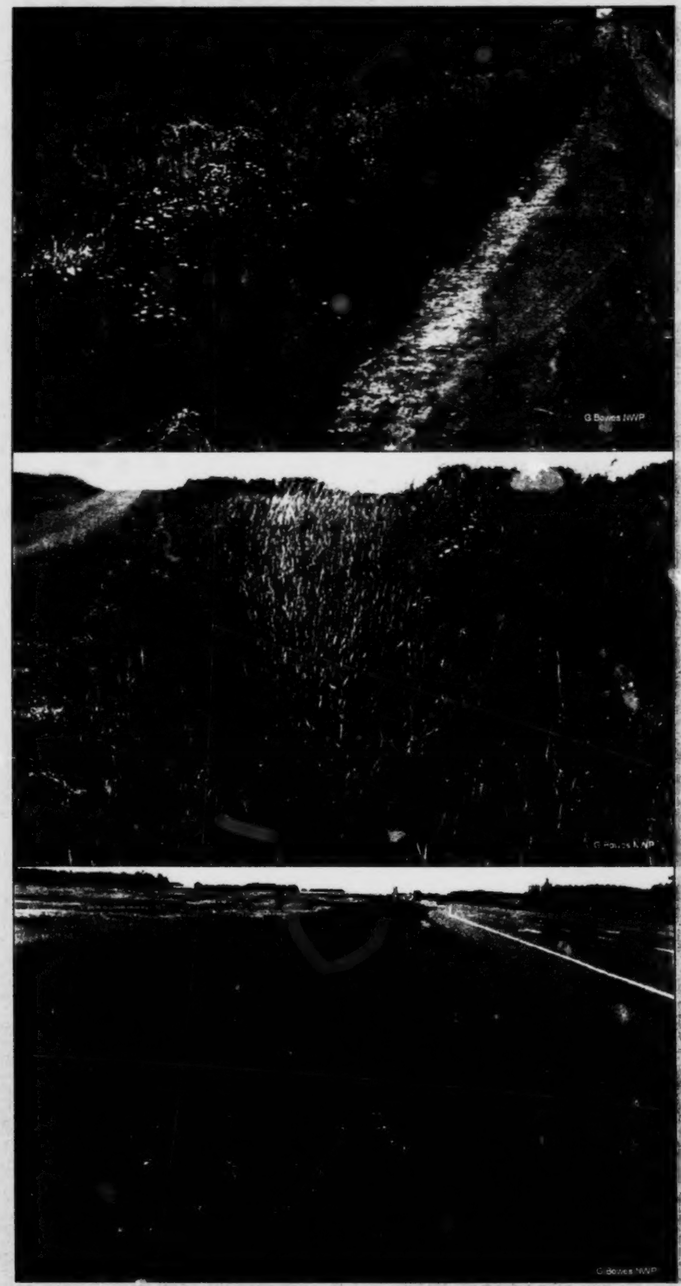


Figure 1 Scentless chamomile growing along a road right-of-way that was not mowed (Top), partly mowed (Middle) and totally mowed (Bottom)

Figure 1 (Top) shows a roadside with scentless chamomile growing with brome. Grading soil against the vegetation makes future mowing very difficult. The site should have been treated with a herbicide earlier in the season.

Figure 1 (Middle) shows a site with a narrow mowed strip before road maintenance. Scentless chamomile is growing in the non-mowed part of the right-of-way. It appears that mowing has prevented flower production and seed set.

On a third site (Figure 1 Bottom), after a single mow, scentless chamomile continued to grow, flower and can set some seed.

In mid-late June, control scentless chamomile with herbicides rather than a mower. Mow road right-of-ways for safety. When a mower is used, the first mow should be high and repeated at lower settings to prevent seed set.

Large Areas with Scentless Chamomile

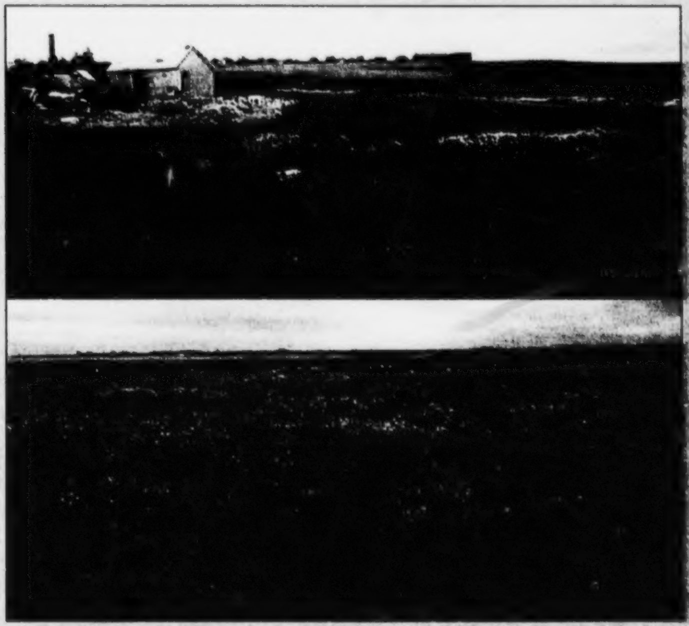


Figure 1 Large areas of land with scentless chamomile: grass storage site (Top) and wet-moist land (Bottom)

Grassed areas that are used for the storage of materials are good growing sites for scentless chamomile (Figure 1 Top).

Figure 1 (Bottom) shows a large wet, poorly drained area with scentless chamomile.

Both of the sites in Figure 1 are good places for the release of seed weevils and gall midges. Allow the agents to establish in an area with a dense stand of scentless chamomile and where there is a low risk of weed spread. Use a herbicide to control the weed in high risk areas for weed spread. The agents will spread and attack scentless chamomile plants that are missed by the herbicide treatment. Seed weevils can travel 2.7 km/year and gall midges can travel 5.2 km/year.

Scentless Chamomile in a Hay Field

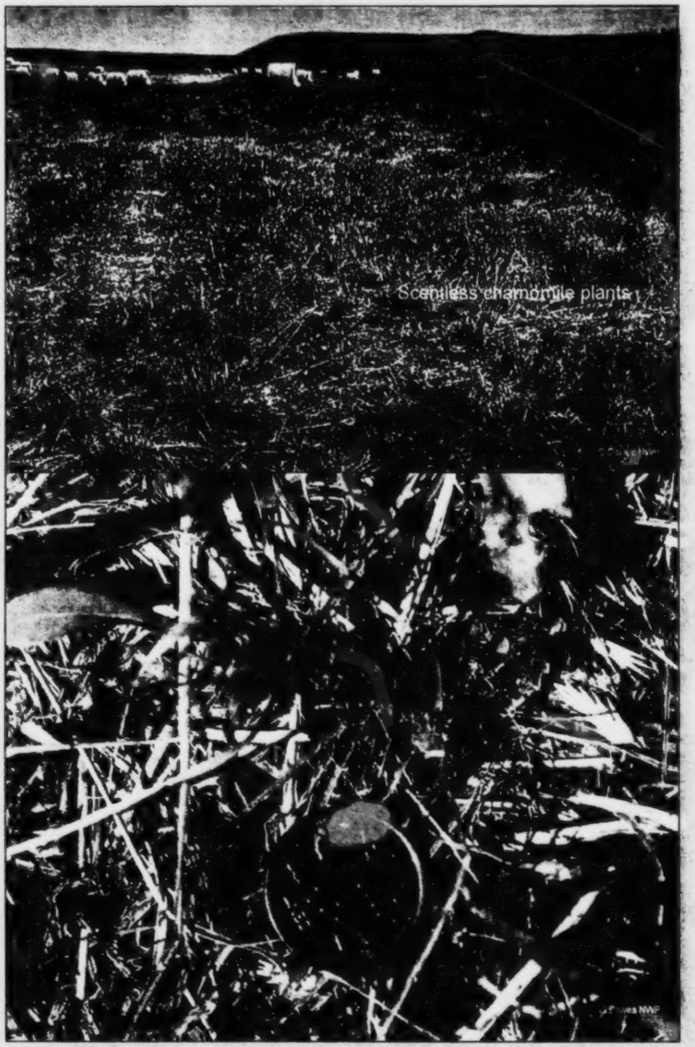


Figure 1 A patch of scentless chamomile in a hay field (Top) and a close-up of a gall on a scentless chamomile plant (Bottom)

Scentless chamomile was found in a hay field (Figure 1 Top). Gall midges were released for weed control. The agents were judged to be established when galls were found (Figure 1 Bottom).

After the hay was cut, flowers appeared on scentless chamomile and most likely seed will be produced (Figure 1 Top). When seed is produced the weed will eventually spread throughout the field.

When scentless chamomile first appears in a field, kill the weed with a herbicide, mark the site with a GPS unit and monitor for control. Retreat any plants with a herbicide that subsequently appears from germinating seed.

The problem associated with gall midges is the production of seed on attacked plants. When seed is produced there is an opportunity for weed spread.

Weed Management Areas

Bob Parsons* championed the use of Cooperative Weed Management Areas as a process for organizing neighbouring landowners to effectively control weeds. This organizational method is widely accepted throughout the mid-west and western states. In California the name has been shortened to Weed Management Areas. This process for organizing weed control is worth considering for use in Saskatchewan.

Weed Management Areas (WMAs) are local organizations that bring together land managers and owners to manage a common weed problem in a common area. WMAs are a partnership of neighbouring landowners and users for the purpose of coordinating efforts and expertise against invasive plants and noxious weeds. Participants in WMAs could be owners of private land, industrial land users and land managers responsible for city, provincial and federal lands.

In Saskatchewan, a WMA could function under a District Agricultural Development and Diversification (ADD) Board or as a stand-alone organization. It may be advisable for a WMA to develop a memorandum of understanding (MOU) among neighbouring landowners for the greatest good of the group to prevent the reproduction and spread of weeds. Attention should be given to the Noxious Weed Act and the invasive exotic species that are identified in the Biodiversity Action Plan for Saskatchewan's Future 2004-2009. Leafy spurge is a designated noxious weed and is also identified as an invasive exotic species. The Noxious Weed Act has been in force in Saskatchewan since 1909, reflecting undesirable plants from the agricultural perspective. Saskatchewan Environment has recently produced a five year plan to preserve biodiversity that has an invasive species component including invasive plants.

*Bob Parsons is the Supervisor for the Park County Weed and Pest Control District in North West Wyoming. He has worked for the District for 26 years. This is a summary of a presentation that Bob made at 'Invasive Plants: Understanding The Threat Conference' that was held in Calgary, Alberta during October 2003. Additional information was gleaned from the web pages for Weed Management Areas in California and Invasive Plant Management Textbook from the Center for Invasive Plant Management in Montana.

The beneficial feature of a WMA is the attempt to address noxious weeds that are specified under an agricultural act and exotic invasive plants that are a major threat to biodiversity in the native plant communities.

Weed infestations do not recognize political boundaries whereas Weed Inspectors are bound by municipal boundaries. Often Weed Inspectors wonder about the extent of their authority on provincial and federal lands. Once a weed like leafy spurge is found, government agencies, private landowners and wildlife agencies may not have budgeted for an expensive weed control project that is needed to effectively stop the weed's spread.

To effectively control large infestations of weeds it is important to take care of weed spread using the same lines of attack that the weed takes. Develop weed control practices that are based on natural ecosystems rather than on political boundaries. It is important to take advantage of every resource available to strengthen our defences against weeds. Landowners need to be willing to venture out of their comfort zone, band together and control weeds as a cooperative venture.

A WMA is not a new concept. Weed Inspectors have worked for years with industrial, government or private landowners to develop a noxious weed control plan that suits the organization with the weed problem and the local community. It is time consuming and divisive to produce ad-hoc control programs, one landowner at a time, and realize that not all landowners are controlling their weeds to the same standard. WMA is a term for a local organization that integrates all weed management resources across jurisdictional boundaries in order to benefit the entire community. The value of a WMA for a Weed Inspector is to have one local umbrella organization for the control of noxious weeds.

The most obvious reason for forming WMAs is to organize to get the job done and coordinate funding. District ADD Boards are a legal identity that can develop requests and submit them for funding. Members of a WMA will be aware of various sources where funding requests can be directed. Check the fine print on funding applications because funds are often available for innovative ideas on weed control rather than for operational expenses. Other reasons for WMA are:

Increased cost efficiency;
Sharing budgets;
Sharing expertise;
Sharing equipment, labour, and/or supplies;
Sharing ideas;
Increased public awareness;
Build positive relationships; and
Overcome old animosities.

There are a number of issues to discuss and decisions to make when forming a WMA. The boundaries of infestation for the worst weeds need to be established. From this information the potential partners are identified. The next step is to establish a Steering Committee with assigned responsibilities. The Steering Committee should select someone (or group) to be the leader and determine their common goals. The Steering Committee will want to develop agreement among the partners. Eventually the WMA group should elect officers; Chairman, Vice Chairman, Financial officer and others. Once this is organized within a WMA there is a need to establish long term goals and objectives, a Management Plan (MP) and develop an Annual Operating Plan (AOP). The length of the MP should be a minimum of 5 years and the AOP should be implemented on an annual bases.

In the USA, WMAs are proving to be one of the most effective ways to manage weeds on large areas, which cross jurisdictional areas. 'Weeds know no boundaries' so why should those who want to control the spread of noxious weeds and exotic invasive species.

Weed Inspectors are in a good position to play a major leadership role in the formation and function of WMAs. Weed Inspectors know how to control weeds and communicate with landowners with noxious weeds.

Since 1999 the Noxious Weed Program has been part of the yearly Weed Inspector Training Clinics. The theory behind the information presented is:

- An approach to prevent weed spread which is Weed Awareness, Education and Control (Integrated Weed Control).
- A strategy to prevent weed spread which is Exclusion, Eradication and Containment.
- A procedure to use Integrated Weed Control which involves
  - scouting for a weed,
  - controlling the weed and
  - monitoring for success.

The above is similar to weed management priorities that are found in the Invasive Plant Management Textbook for the development of WMAs. These are:

- First — Prevention of potential invaders;
- Second — Control of new and invading species new to a particular part of the WMA; and
- Third — Containment and management efforts on established stands.

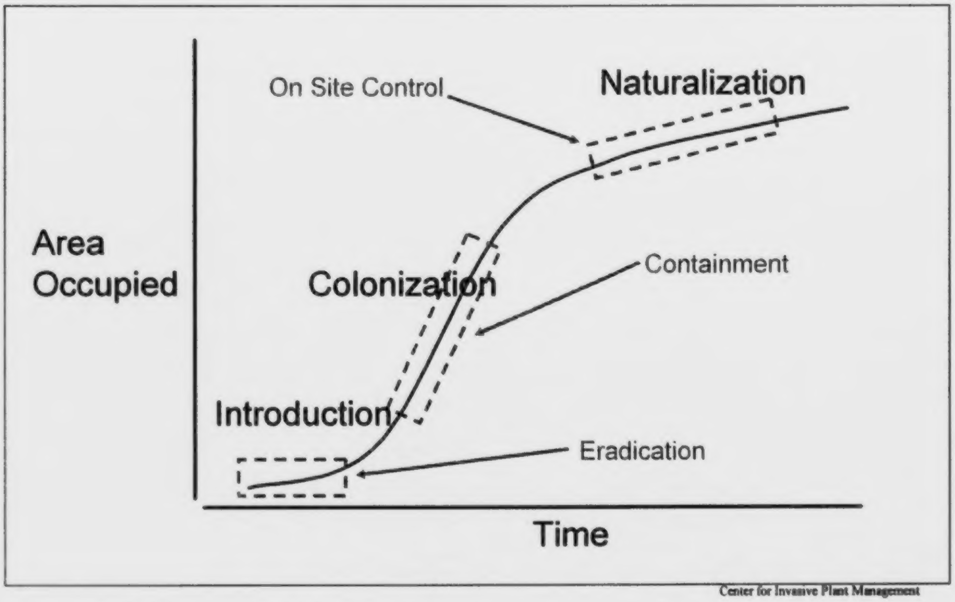
The textbook is available online from the Center for Invasive Plant Management in Montana.

The Proactive Weed Inspector

A proactive Weed Inspector looks for noxious weeds before the weeds spread and become a serious weed problem.

When a noxious weed like leafy spurge first invades (**Introduction**) an area, there is an opportunity for eradication (Figure 1).

It takes about four years for leafy spurge to start to spread aggressively (Figure 1). This is an opportunity for eradication. The Introduction phase for leafy spurge lasts about four years.


On Site Control
Naturalization
Area Occupied
Colonization
Containment
Introduction
Eradication
Time

Center for Invasive Plant Management

Figure 1 The invasion of a new weed to a new location

Colonization is the rapid expansion of a weed over an area (Figure 1). This is very noticeable to land owners and is often when a weed like leafy spurge is reported. Because of the large area occupied by the weed and the large quantity of seed in the soil seed bank, eradication is most likely impossible. The weed must be contained (Figure 1). If a weed like leafy spurge is not contained or can not be contained then it will expand over most permanent grass areas (Figure 2).

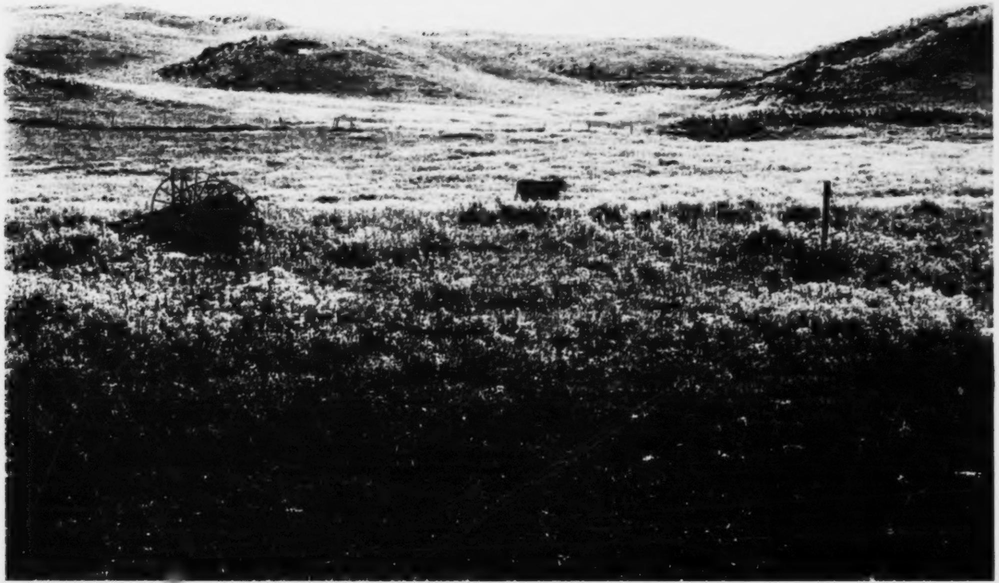


Figure 2 Leafy spurge growing in a large portion of a pasture

To find noxious weeds like scentless chamomile and leafy spurge when they are first introduced, Weed Inspectors should scout roads and wetlands where the weeds are most likely to be found.

District #43 used a GPS unit and a Palm Pilot to map the distribution of scentless chamomile in the RM of Morris (Figure 3). Scentless chamomile was found growing along provincial highways, grid roads and in wetlands by water.

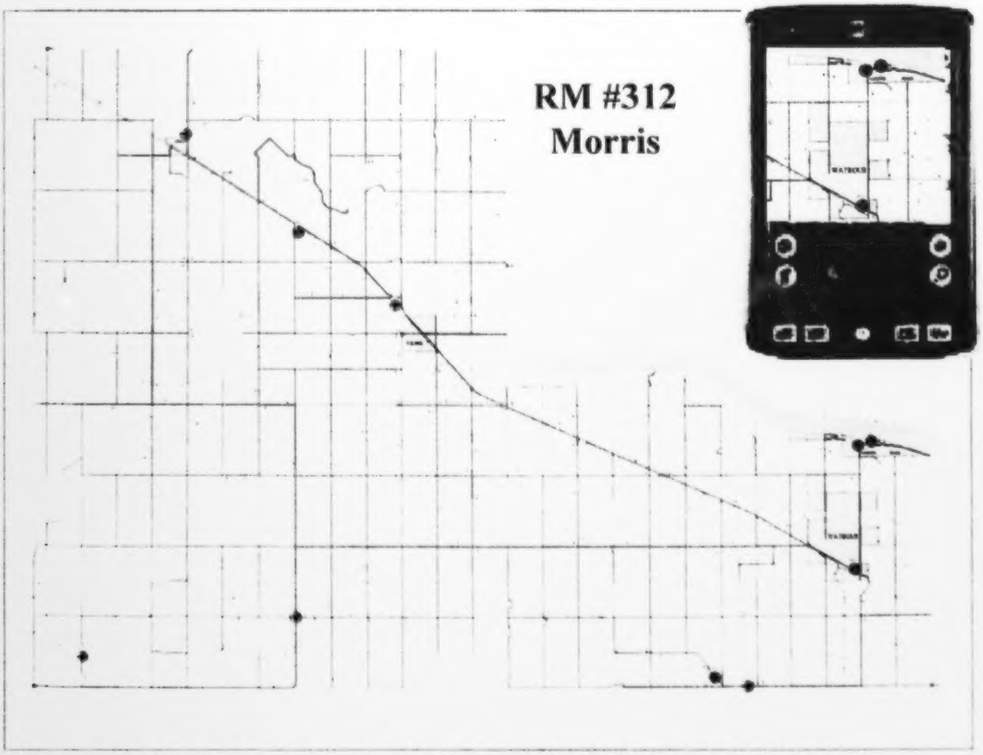
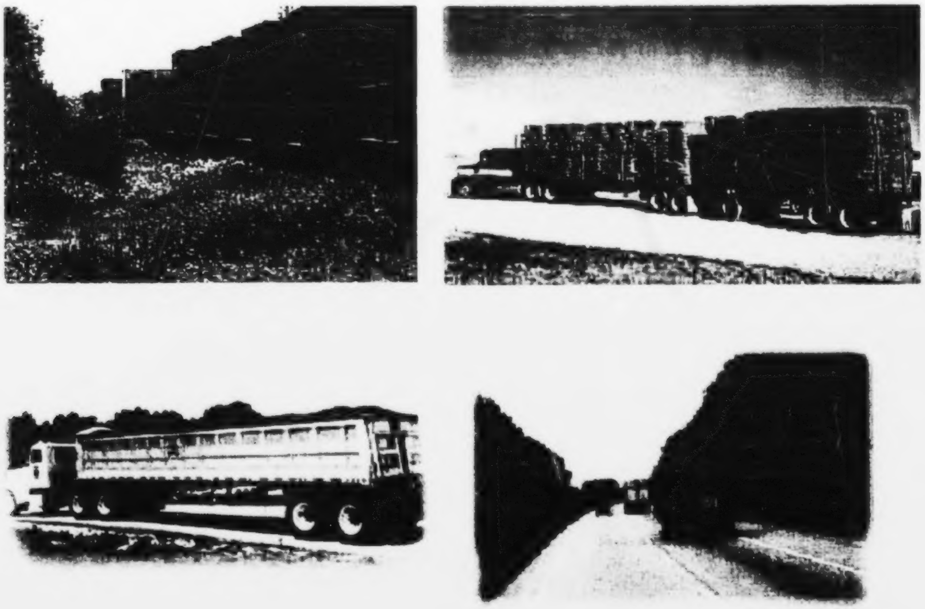


Figure 3 The distribution of scentless chamomile in the R M of Morris

Most likely scentless chamomile was found along major transportation routes because of the increasing movement of agricultural products over long distances (Figure 4). Moving agricultural products allows hitchhiking weeds to drop off their ride at any place from the pick-up to delivery site.



Photos by K Boras Lacombe County

Figure 4 Weeds often hitchhike a ride with agricultural products

When Scentless Chamomile is first found by a proactive Weed Inspector it should be picked, bagged and burned (Figure 5). When there are white petals on a picked scentless chamomile plant, then some viable seed could be set. To prevent seed from entering the seed bank, picked plants should be bagged and burned.

Weed inspectors should develop a 10-year plan to control weeds like scentless chamomile and leafy spurge. Plan control for 5 years, evaluate and develop a new 5 year plan. For scentless chamomile it may be necessary to pick-bag-burn for more than 10 years.

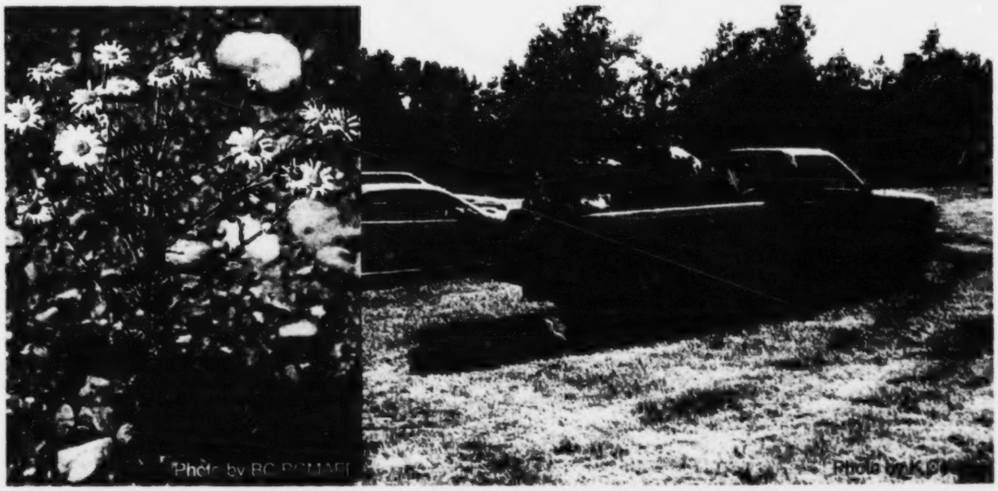


Photo by BC BCMAFF

Photo by K.

Figure 5 Pick, bag and burn is an effective method to control Introduced Scentless Chamomile

Stop the Spread of Leafy Spurge

To stop to spread of noxious weeds like leafy spurge, Weed Inspectors should use the proven weed control strategy of **Exclusion**, **Eradication** and **Containment**.

Exclusion is quarantining the weed at far away locations. **Eradication** is reducing a weed's population to zero. **Containment** is containing a weed's population within a specific area.

Each year hay is transported across the province (especially the winter of 2001 – 2002). Leafy spurge can hitchhike a ride before dropping off along the edge of provincial highways and grid roads.

Scout for leafy spurge (find new patches when small), control the weed and monitor for treatment success.

Leafy spurge does not usually flower during the seedling year (Figure 1). Two year-old and older plants flower and set seed (Figure 2). Non-flowering plants are nearly impossible to find along a right-of-way.

Figure 1 A leafy spurge seedling

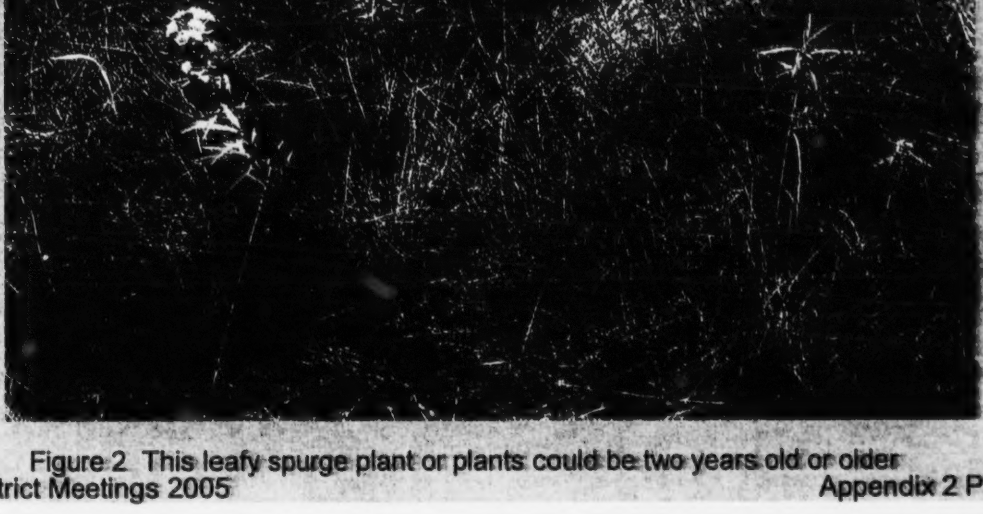


Figure 2 This leafy spurge plant or plants could be two years old or older

For leafy spurge shown in Figures 2 and 3, start an eradication program and plan for yearly control for ten years. It takes several years before leafy spurge forms a solid patch. Leafy spurge shown in Figure 3 is most likely four or more years old. This is the start of a patch that contains one or more plants. Most likely seed was set in at least the previous year. Seed can remain viable in the soil for at least eight years.

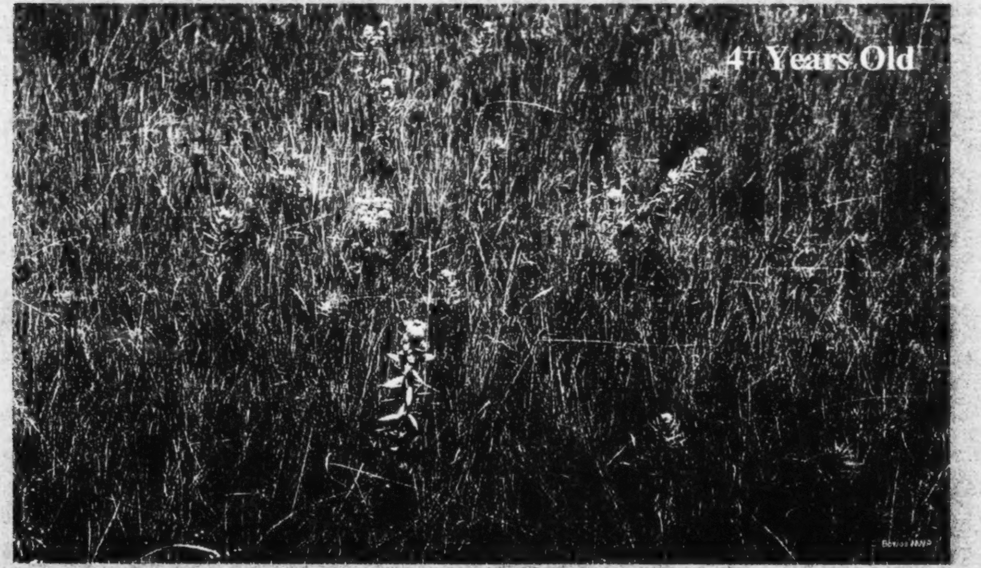


Figure 3 This is when new patches of leafy spurge are often found

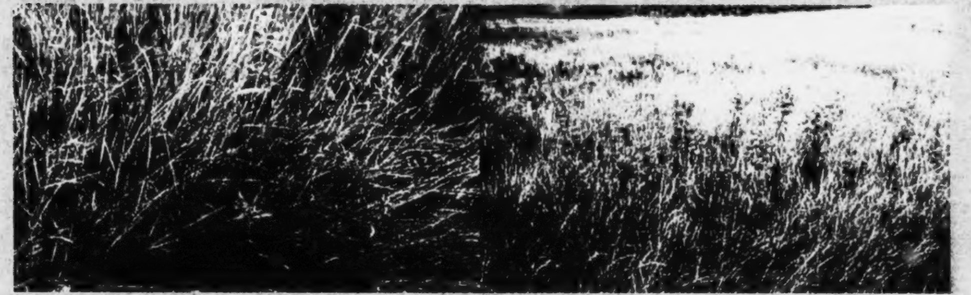


Figure 4 In the fall some leafy spurge plants are crimson red and most are upright in grass stands

Leafy Spurge Flea Beetle Collection and Distribution

For successful suppression of leafy spurge, many beetle releases should be made. Figure 1 shows suggested release sites. Figure 2 shows an area with priority areas and releases are first made in the area with the highest priority. Priority 1 (p1) should be the best sites for beetle establishment (south slope, loam-clay soils).

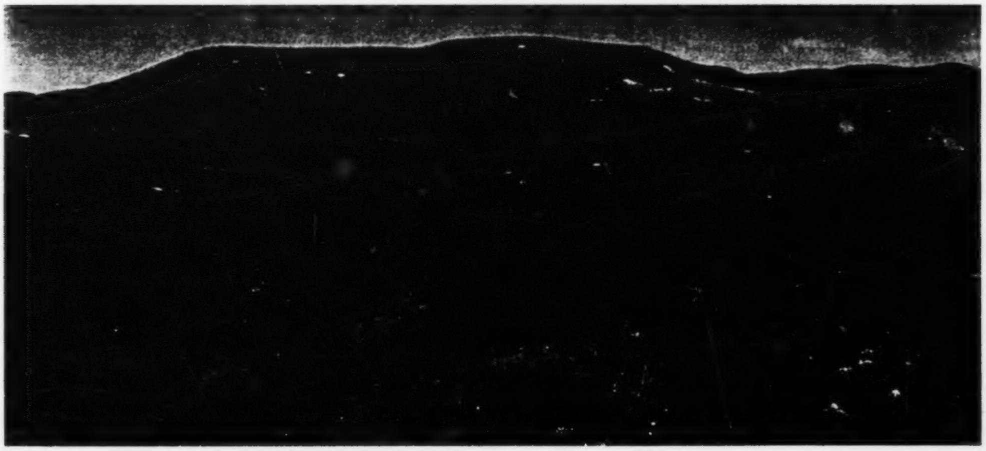


Figure 1 Suggested sites for multiple releases of leafy spurge flea beetles

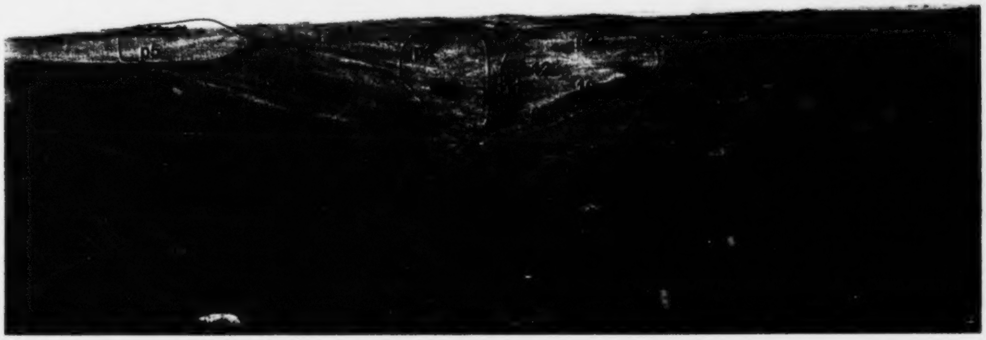


Figure 2 Suggested sites for multiple releases of leafy spurge flea beetles in priority areas 1 to 5 (p1 to p5)

Once beetles establish, solid stands of leafy spurge disappear and scattered groupings of plant stems appear at various densities. The suppression or reduction in the weed may or may not meet the control expectations of the land owner (Figure 3 and 4). In the future there may or may not be further suppression of leafy spurge.

Figure 3 A pasture near Maxim, showing the suppression of leafy spurge on a site in 2004 following the release of beetles in 1982, 1983 and in the 1990's

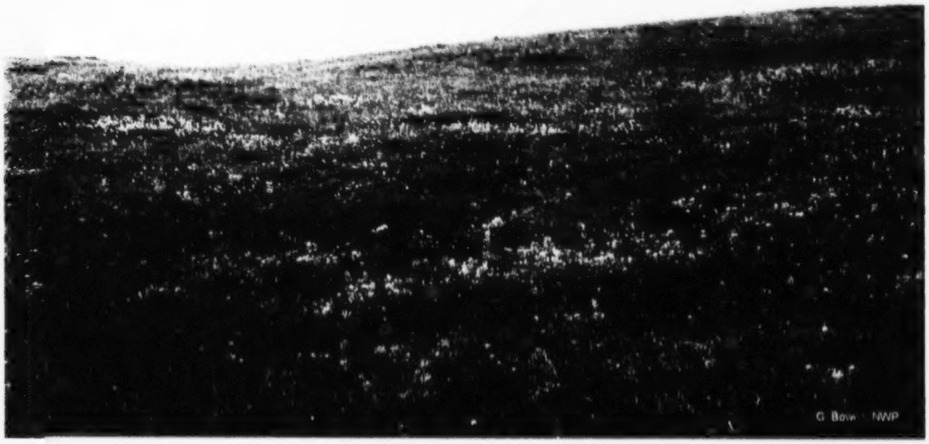
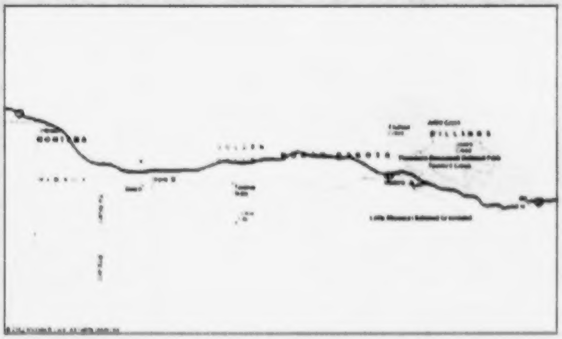


Figure 4 Suppression of leafy spurge on top of the north ridge of the valley in the pasture shown in Figure 3

Example of a Large Scale Beetle Release

In Theodore Roosevelt National Park, integrated weed control methods (biocontrol and herbicides) were used to control leafy spurge. Successful control was partly related to a large number of flea beetle releases.

The park was mapped for leafy spurge (Figure 1). The various areas in the park were given a priority, 1 to 6. Beetles were collected and released in the priority 1 area and then they were released in the priority 2 area. Priority 1 was the river and priority 2 was the park boundary.



Theodore Roosevelt National Park is located in the badlands of North Dakota near the Montana border.

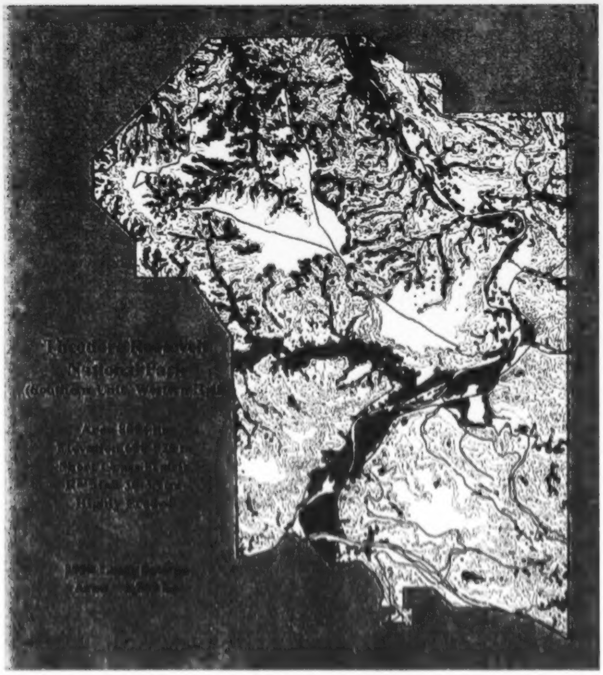

Theodore Roosevelt
National Park

Figure 1 The extent of leafy spurge in the park

Figure 1 is a map showing the distribution of leafy spurge in the park. Figure 2 shows the distribution of many beetle releases in areas with leafy spurge.

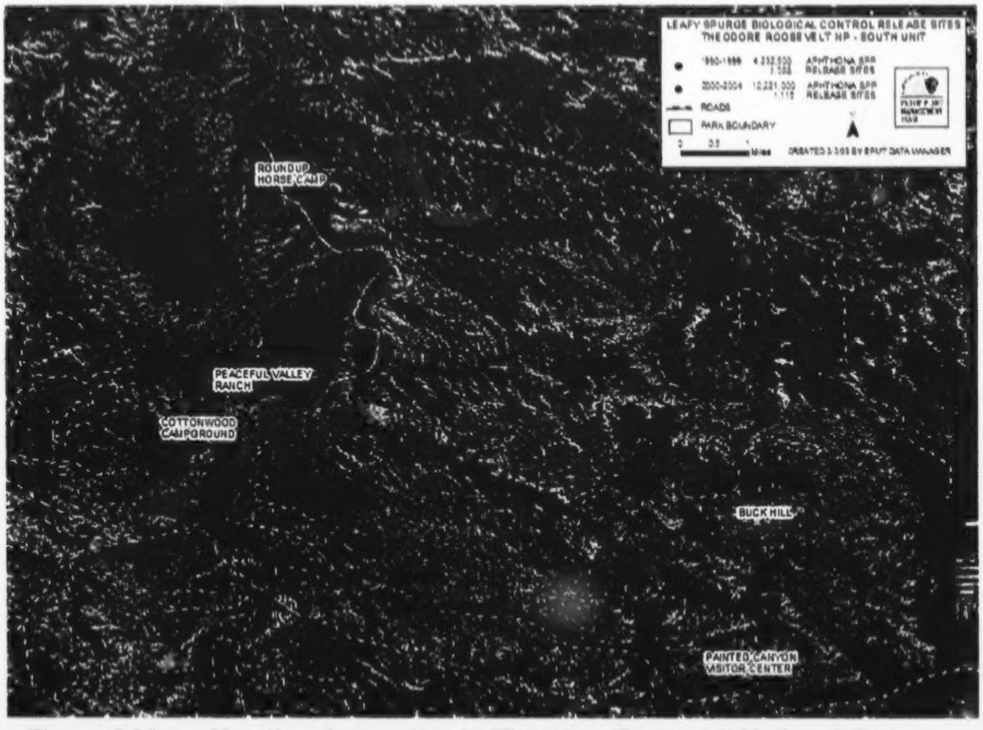
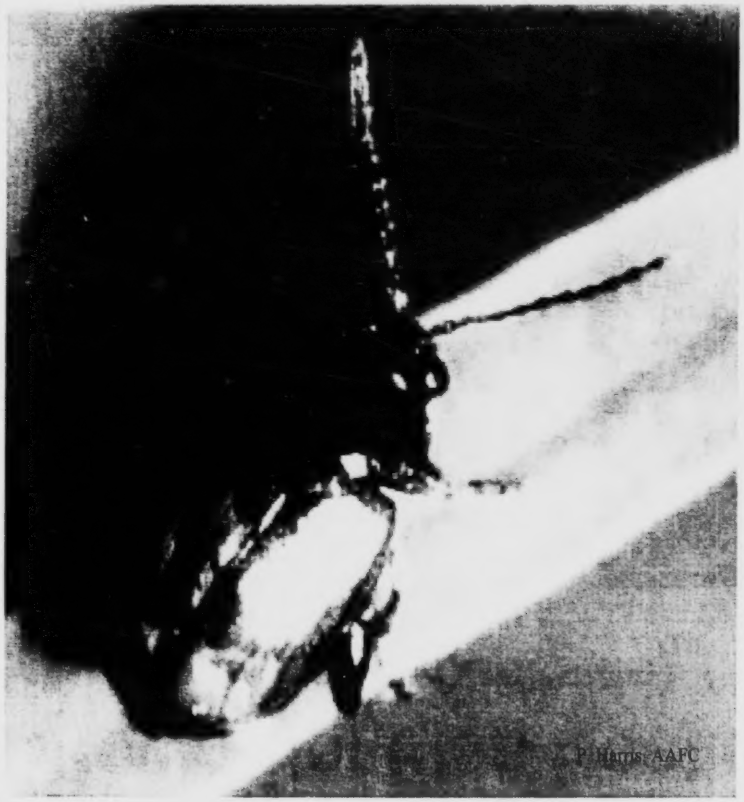

LEAFY SPURGE BIOLOGICAL CONTROL RELEASE SITES
THEODORE ROOSEVELT NP - SOUTH UNIT
APHTHONA SPP
RELEASE SITES
2000-2004
APHTHONA SPP
RELEASE SITES
ROADS
PARK BOUNDARY
0
0.5
1
Miles
N
ROUNDUP HORSE CAMP
PEACEFUL VALLEY RANCH
COTTONWOOD CAMPGROUND
BUCK HILL
PAINTED CANYON VISITOR CENTER

Figure 2 Map of beetle release sites in Theodore Roosevelt National Park

Black Dot Flea Beetle

(*Aphthona nigriscutis*)



- Identification
  - Bronze color with a black dot located behind the head
- Release Site Characteristics
  - Release 1000^+ beetles per release point
  - Coarse and dry to very dry soils
  - Soil warmed by aspect or lack of ground cover
  - Spurge density $<60/m^2$

P Harris, AAFC

Brown Dot Flea Beetle

(*Aphthona cyparissiae*)

- Identification
  - Bronze color with a brown dot located behind the head
- Release Site Characteristics
  - Release 1000⁺ beetles per release point
  - Spurge density 50 – 125/m²
  - Soil sand content 40 – 60%
  - Green needle grass – Kentucky blue grass

P. Harris, AAFC

Black Flea Beetle
(*Aphthona lacertosa*)

USDA - APHIS - PPQ
Bozeman, MT

- Identification
  - Black in colour
- Release Site Characteristics
  - Release 1000^+ beetles per release point
  - Moist loam to clay soils
  - Competing vegetation taller than leafy spurge

P Harris AAFC

Leafy Spurge Disappears at Maxim

Leafy spurge dominated most of the vegetative cover in a valley which is more than 2 kilometres long and up to several hundred kilometres wide near Maxim, SK (Figure 1 and 2). Water flows from the west to a small pond at the east end.

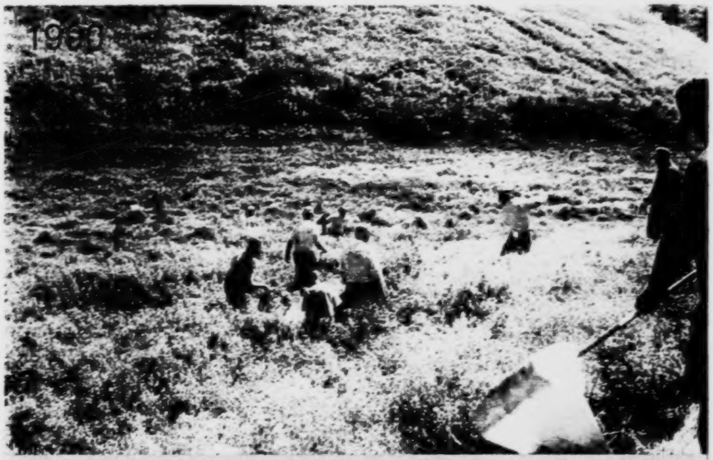


Figure 1 Leafy spurge in the valley

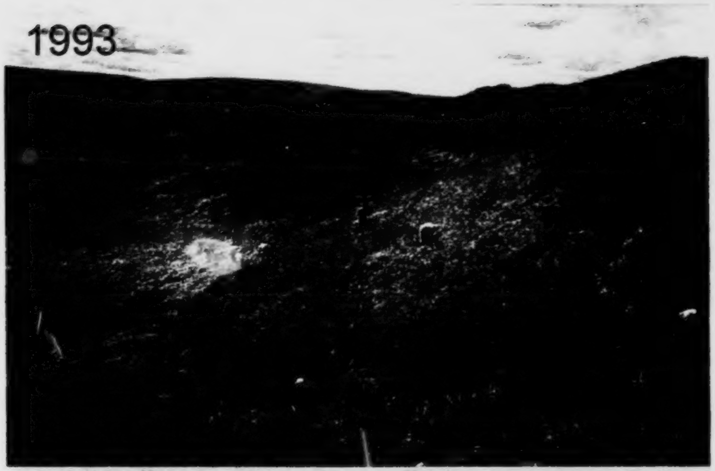


Figure 2 Leafy spurge in the valley

Three species of *Aphthona* flea beetles were released in the eastern part of the valley for the suppression of leafy spurge. In 1982 brown dot flea beetles (*A. cyparissiae*) and in 1983 black dot flea beetles (*A. nigriscutis*) were released on the south facing slope of the valley. Between 1991 and 1996 black flea beetles (*A. lacertosa*) were released in the valley bottom and on the north ridge.

Leafy Spurge Disappears (east end of the valley)

1991

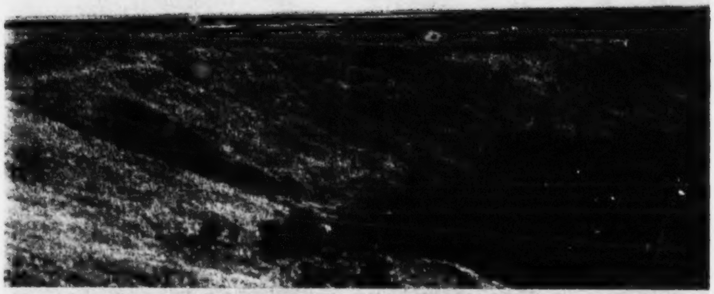


Figure 3 Leafy spurge at the east end of the valley

Figure 3 shows the release point (X) for the brown dot flea beetle on the south facing slope of the valley. In 1991 the entire south slope was covered by leafy spurge.

1992

Figure 4 Leafy spurge disappears at the brown dot release site

Figure 4 shows disappearance of leafy spurge around the release point (outline in blue by the arrow).

Leafy Spurge Disappears (east end of the valley)

2001

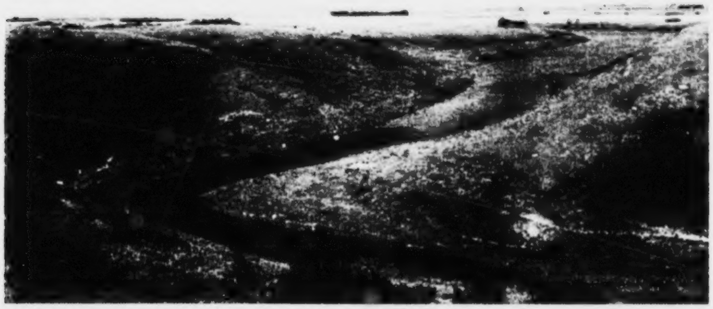


Figure 5 Thinned out leafy spurge on the south facing slope

2004

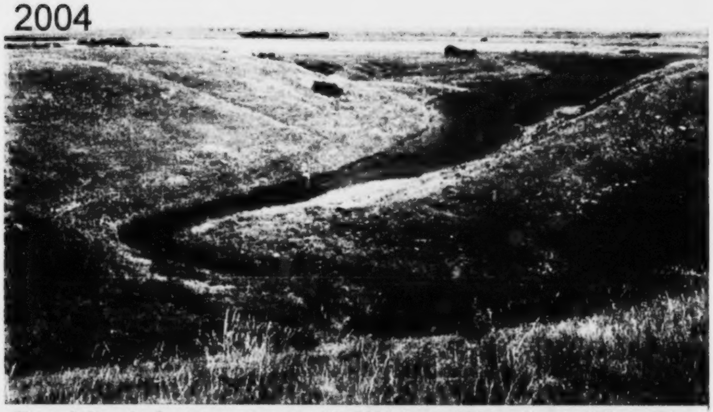


Figure 6 Less leafy spurge was present in 2004 than in 2001 on the south facing slope

2005

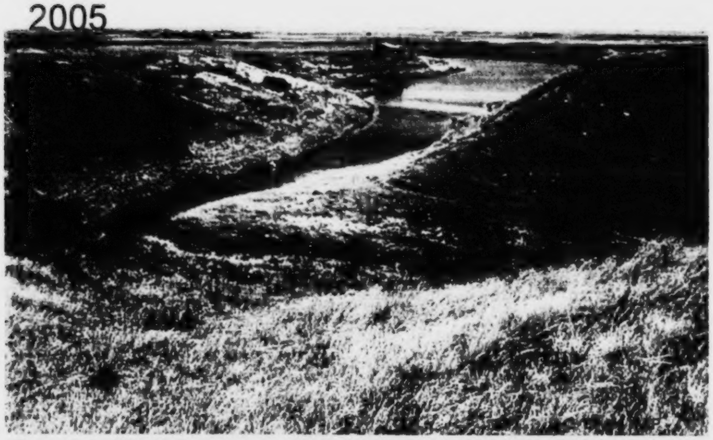


Figure 7 In 2005 leafy spurge disappeared on the south slope in the valley's east end

In 2001 leafy spurge was thinned out on most of the south facing slope but the shoots density was still too high to meet the control expectations of ranchers (Figure 5).

In 2004 the feeding of the beetle larvae on the roots of leafy spurge continued to reduce the weed (Figure 6). All three beetle species could be found on the south facing slope.

In 2005 leafy spurge disappeared except for the occurrence of a few shoots or small groupings of shoots here and there in the east end of the valley (Figure 7).

Leafy Spurge Disappears (middle of the valley)

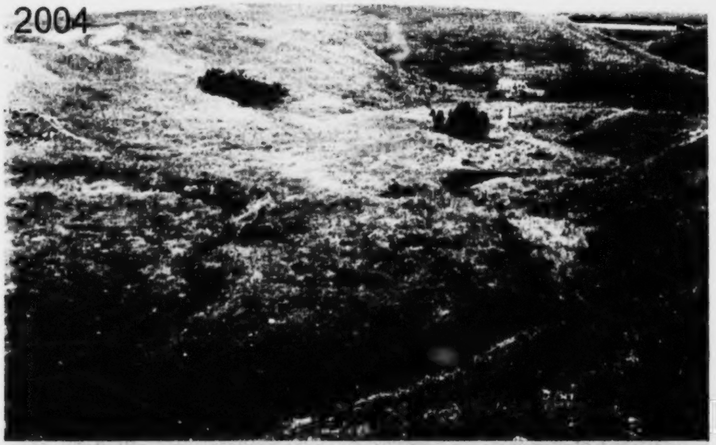


Figure 8 Leafy spurge in the valley in 2004

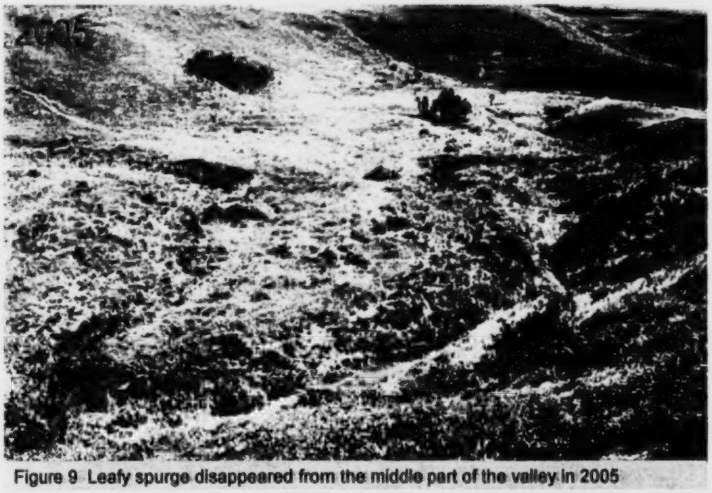


Figure 9 Leafy spurge disappeared from the middle part of the valley in 2005

Figure 8 shows leafy spurge growing on the south and north facing slopes, and in the bottom of the middle part of the valley in 2004.

In 2005 leafy spurge disappeared except for a few occurrences of the weed (Figure 9).

There mostly likely will always be a few shoots of leafy spurge with beetles keeping the weed under control.

To appreciate the size of the area with leafy spurge that was suppressed by the beetles, compare the size of the old building in the upper right corner of Figures 8 and 9 with the building in Figures 4, 5, 6 and 7. This is the same building.

Leafy Spurge Disappears

(west end of the valley)

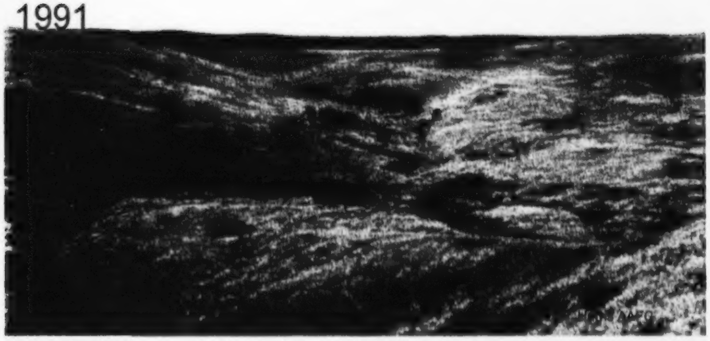


Figure 10 Leafy spurge in the west end of the valley

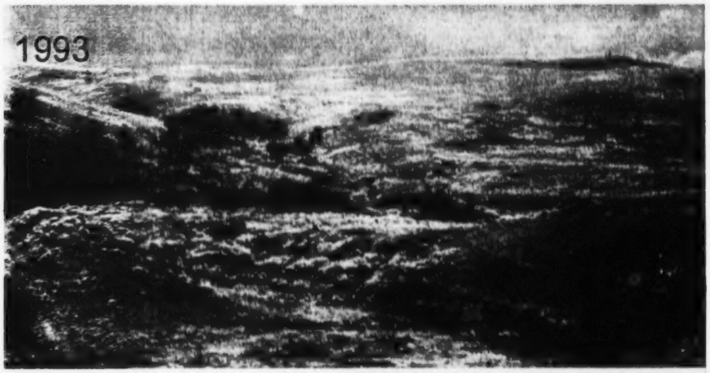


Figure 11 By 1993 there appeared to be fewer shoots of leafy spurge in flower

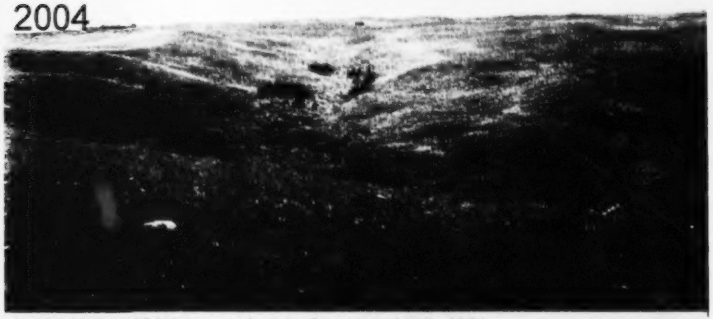


Figure 12 By 2004 there was less leafy spurge than in 1991

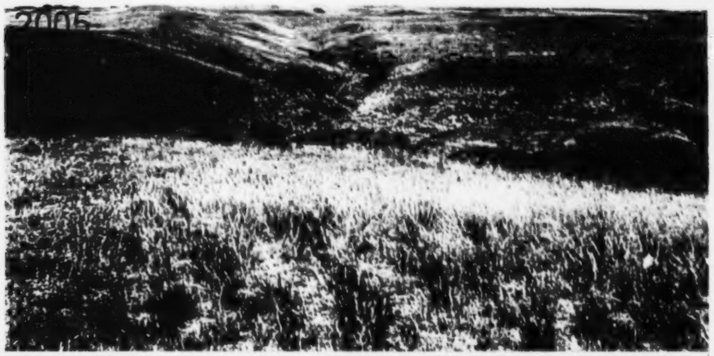


Figure 13 By 2005 leafy spurge had disappeared from large areas

Leafy spurge covered most of the west end of the valley in 1991(Figure 10).

In 1993 there was less leafy spurge than in 1991 (Figure 11). There was a further reduction in the occurrence of the weed by 2004 (Figure 12) and it disappeared from many sites by 2005 (Figure 13).

The beetles moved from east to west on their own. Suppression may have been quicker if many releases had been made in the valley during the late 1980's and early 1990's.

A Comparison of the Leafy Spurge Flea Beetles Performance on Four Sites

Leafy spurge flea beetles were released on leafy spurge at four different sites in Last Mountain House Historic Park. The performance of the beetles to suppress the weed was very different from site to site. Because it is difficult to select the best site, always make multiple releases each year for several years.

Beetle Performance on Site 070 (north facing slope)

2002
G. Bowes NWP

A Comparison of the Leafy Spurge Flea Beetles Performance on Four Sites

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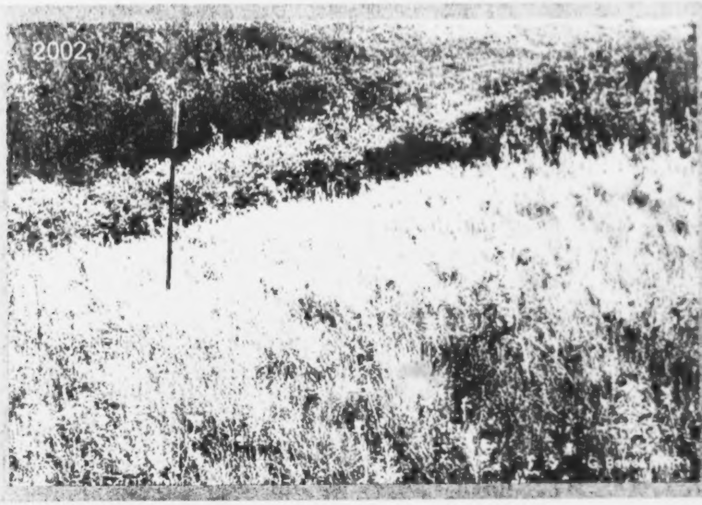
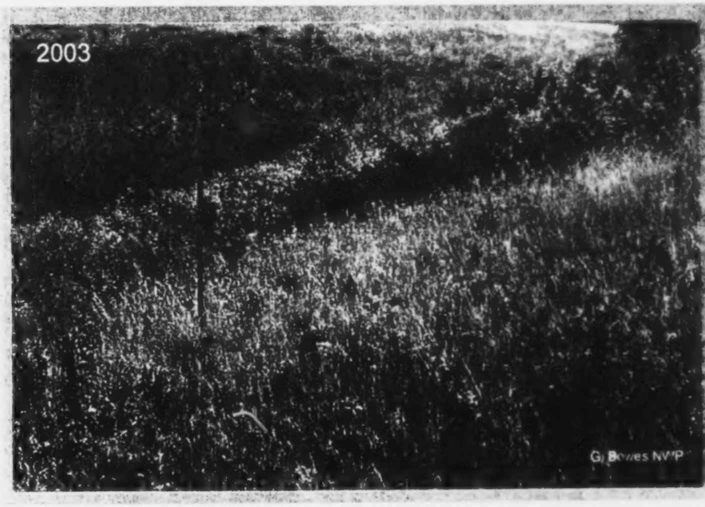
Beetle Performance on Site 070 (north facing slope)



Black leafy spurge flea beetles were released in 1996 at the stake

The number of beetles per sweep (sw) are:
- 2000: 1/sw
- 2002: 5-6/sw
- 2003: 7-35/sw
- 2004: 1-4/sw
- 2005: 1/sw

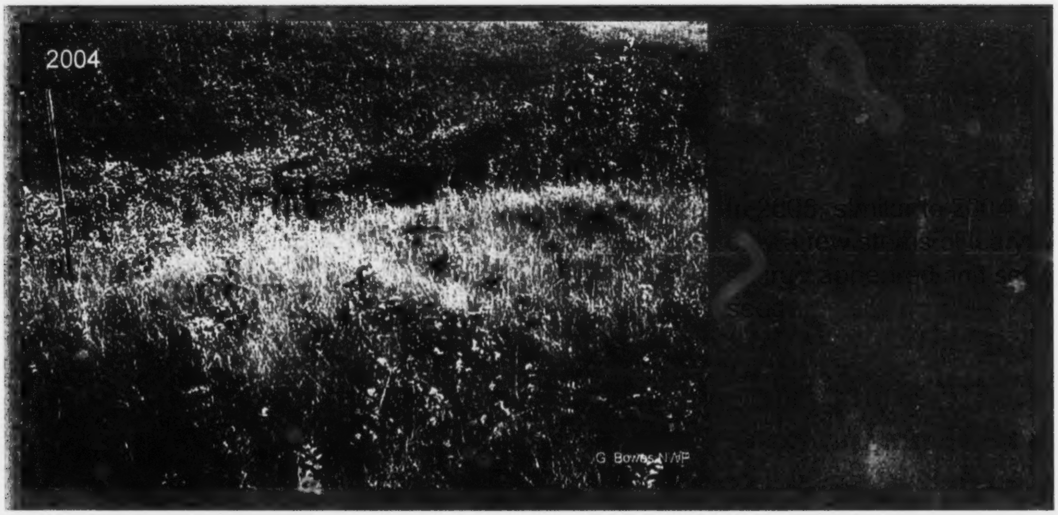
Notice the amount of leafy spurge that is in flower



In 2003, there were fewer leafy spurge stems than in 2002 and only a few stems flowered. There was very little yellow in 2003

2004
G. Bowes NWP

In 2004, only a few stems of leafy spurge appeared and only a few of these stems flowered and set seed.



In 2005, similar to 2004, only a few stems of leafy spurge appeared and set seed.

Conclusion

On this site, 2003 was the best time to capture beetles for release at a new site. Adult beetle emergence is staggered, so on warm sunny days, start sampling around the first of July for the best collection day. Sweep for beetles during the warmest part of the day. Collect for release when the number per sweep is high.

Beetle Performance on Site 071 (west facing slope)

In 2004, only a few stems of leafy spurge appeared and only a few of these stems flowered and set seed

In 2005, similar to 2004, only a few stems of leafy spurge appeared and set seed

Conclusion

On this site, 2003 was the best time to capture beetles for release at a new site. Adult beetle emergence is staggered, so on warm sunny days, start sampling around the first of July for the best collection day. Sweep for beetles during the warmest part of the day. Collect for release when the number per sweep is high.

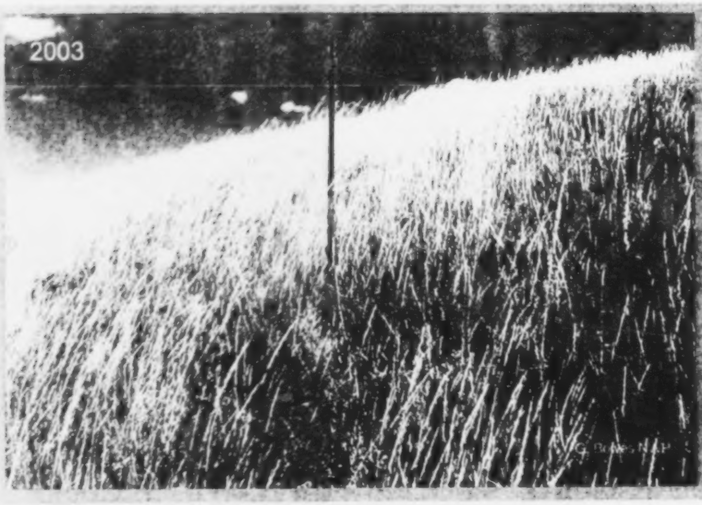
Beetle Performance on Site 071 (west facing slope)

Black leafy spurge flea beetles were released in 1996

Number of beetles per sweep (sw) are:

- 2000: <1/sw
- 2002: 0/sw
- 2003: 0/sw
- 2004: 1-3/sw
- 2005: 0/sw

In 2002 no leafy spurge stems were found near the release point



In 2003 no leafy spurge stems were found near the release point

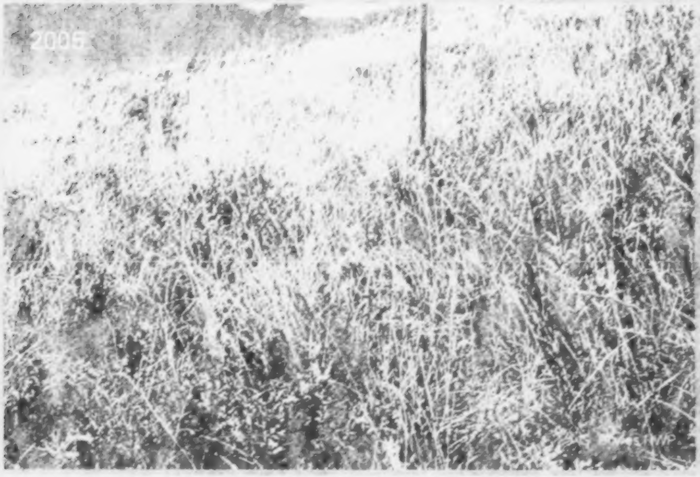
2005
G. Bowes

Conclusion

Biological control agents like the flea beetles never eradicate leafy spurge. As the food supply (leafy spurge) dwindles, a small number of adult beetles remain and feed on the stems. The stems that are visible in 2004 and 2005 may have originated from seed or roots that were not consumed by the larval stage of the beetles. As the number of leafy spurge stems increases, the number of beetles will increase. Over time, the number of leafy spurge stems will fluctuate around an equilibrium that depends on the intensity of the beetle attack and the ability of leafy spurge to survive the attack. The equilibrium will fluctuate with environmental conditions.

Beetle Performance on Site 069 (east facing slope)

In 2004, a few leafy spurge stems grew near the release point and, a few stems flowered and set seed



In 2005 similar to 2004, only a few stems of leafy spurge appeared and set seed

Conclusion

Biological control agents like the flea beetles never eradicate leafy spurge. As the food supply (leafy spurge) dwindles, a small number of adult beetles remain and feed on the stems. The stems that are visible in 2004 and 2005 may have originated from seed or roots that were not consumed by the larval stage of the beetles. As the number of leafy spurge stems increases, the number of beetles will increase. Over time, the number of leafy spurge stems will fluctuate around an equilibrium that depends on the intensity of the beetle attack and the ability of leafy spurge to survive the attack. The equilibrium will fluctuate with environmental conditions.

Beetle Performance on Site 069 (east facing slope)

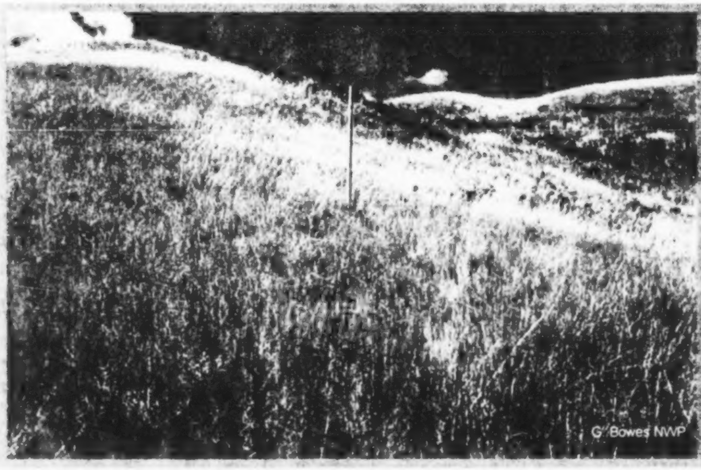
G. Bowes NWP

Black leafy spurge flea beetles were released in 1996 at the stake

The number of beetles per sweep (sw) are:

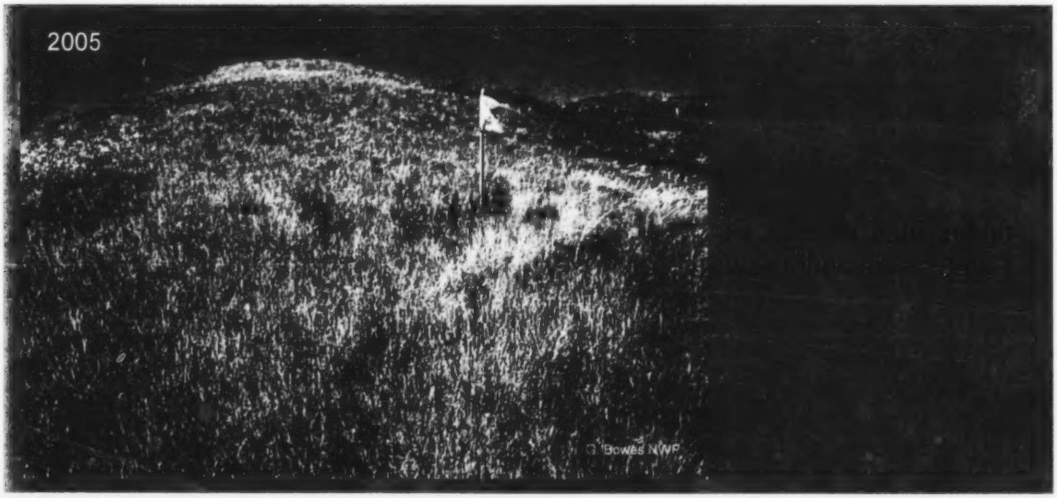
- 2000: 0/sw
- 2002: >1/sw
- 2003: 0/sw
- 2004: 0/sw
- 2005: 0/sw

In 2002 no leafy spurge was found at site 069



G. Bowes NWP

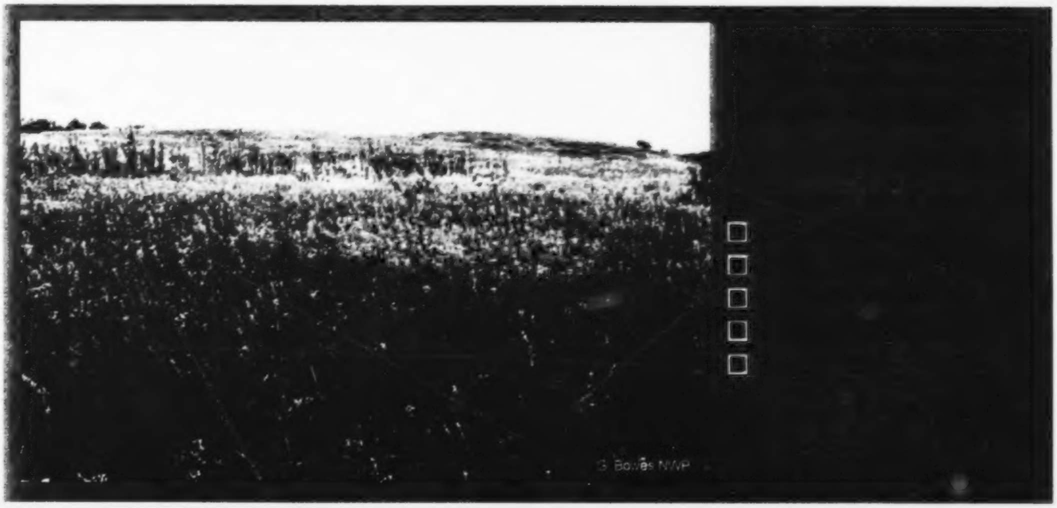
In 2003 no leafy spurge was found at site 069


2005
G. Bowes NWP

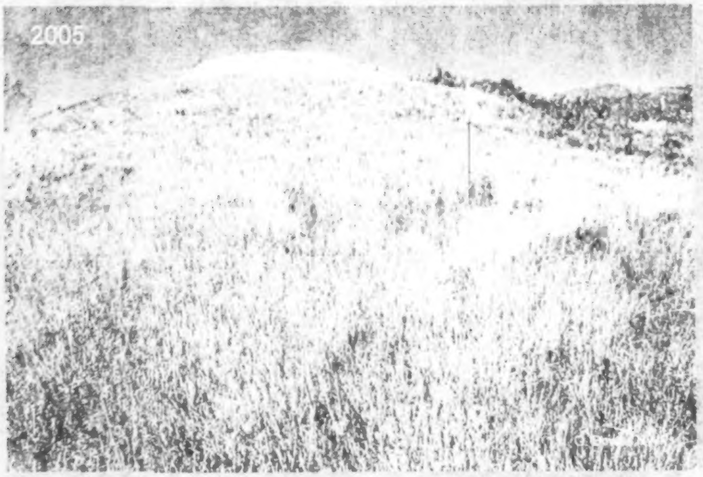
Conclusion

Leafy spurge disappeared. On this site, 3 small leafy spurge plants were found in 2000 and less than 1 beetle per sweep was found in 2002.

Beetle Performance on Site 072 (on the valley ridge)



In 2004 no leafy spurge was found at site 069



In 2005 no leafy spurge was found at site 069

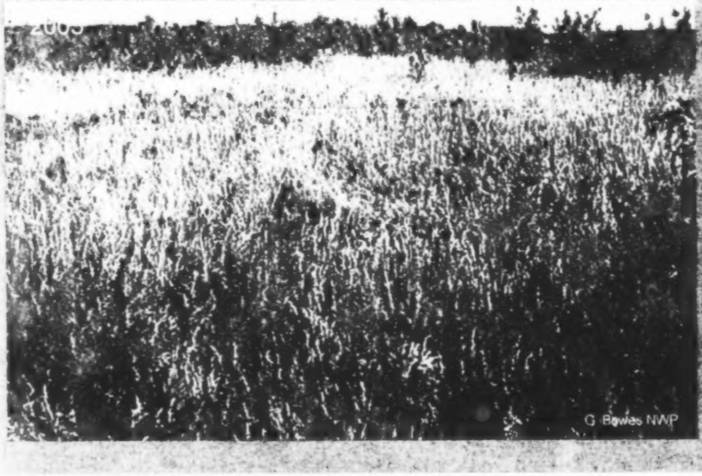
Conclusion

Leafy spurge disappeared. On this site, 3 small leafy spurge plants were found in 2000 and less than 1 beetle per sweep was found in 2002.

Beetle Performance on Site 072 (on the valley ridge)

Black leafy spurge flea beetles were released in this area in 1996

The number of beetles per sweep (sw) are:
- 2000: 1/sw
- 2002: 3-4/sw
- 2003: 6-16/sw
- 2004: 0-4/sw
- 2005: 1/sw



This photograph shows a circle of vegetation with little leafy spurge. Beetle counts were highest on leafy spurge that grew at the edge of the circle. 2003 was the best year to collect. Beetles suitable for collection were found on leafy spurge in a large area to the west of the silver berry (area in the photograph)

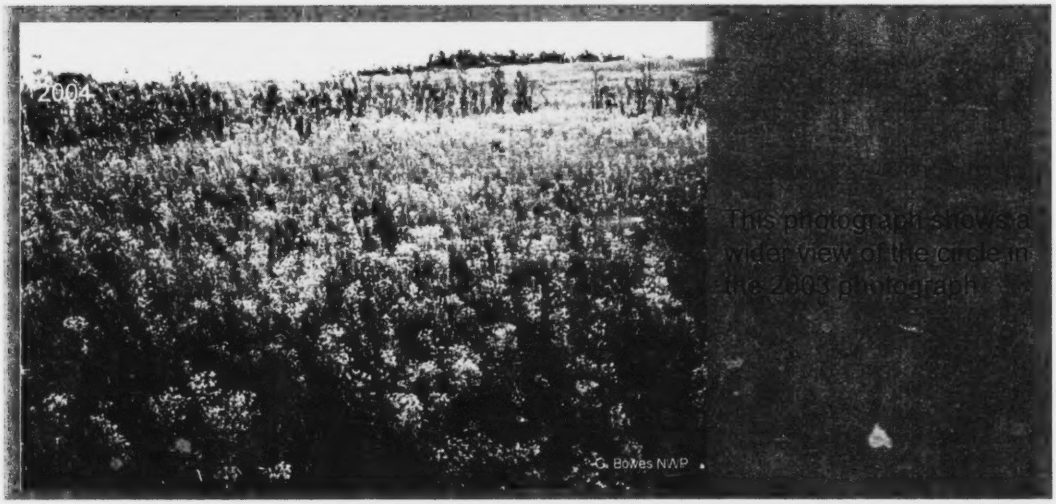
This photograph shows a wider view of the circle in the 2003 photograph

This photograph shows a wider view of the 2004 photograph. Note the location of the aspen bluff in the back ground. The size of the leafy spurge patch is smaller

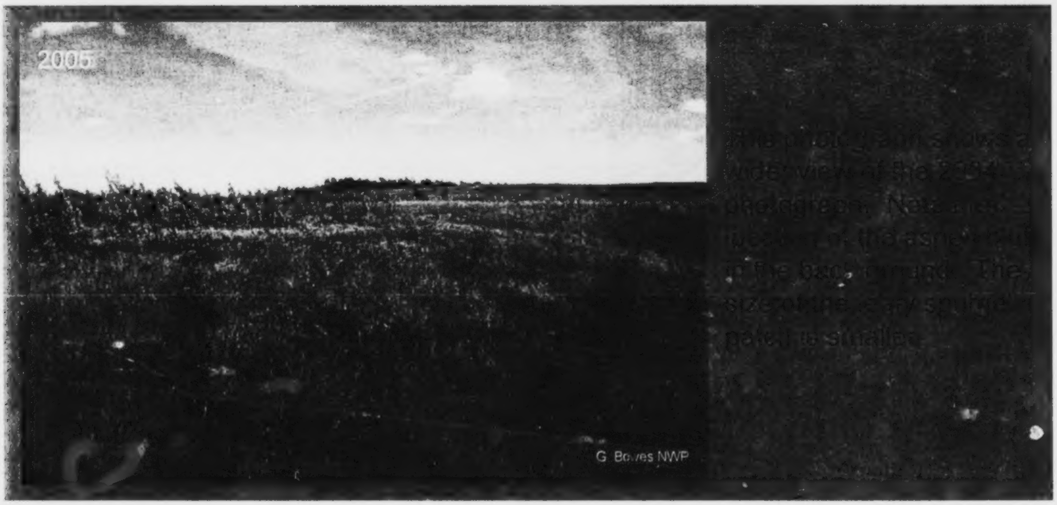
Conclusion

At Last Mountain House Historic Park (LMHHP) leafy spurge beetles established and are slowly thinning out and reducing the size of the weed patches. At this site leafy spurge beetles were collect in 2003 for release in other locations. Since then the number of beetles per sweep has gradually declined.

After releases the area around the release sites should be monitored each year for beetles. It appears that high beetle number are present for only a few years. In the case of LMHHP there was only one good year (2003) for collection.



This photograph shows a wider view of the circle in the 2003 photograph



This photograph shows a wider view of the 2004 photograph. Note [illegible] [illegible] of the aspen [illegible] in the background. The size of the leafy spurge patch is smaller.

Conclusion

At Last Mountain House Historic Park (LMHHP) leafy spurge beetles established and are slowly thinning out and reducing the size of the weed patches. At this site leafy spurge beetles were collect in 2003 for release in other locations. Since then the number of beetles per sweep has gradually declined.

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G. Bowes NWP

What happens when leafy spurge control is neglected!

Leafy Spurge: Everyone's Problem

- At a sport complex

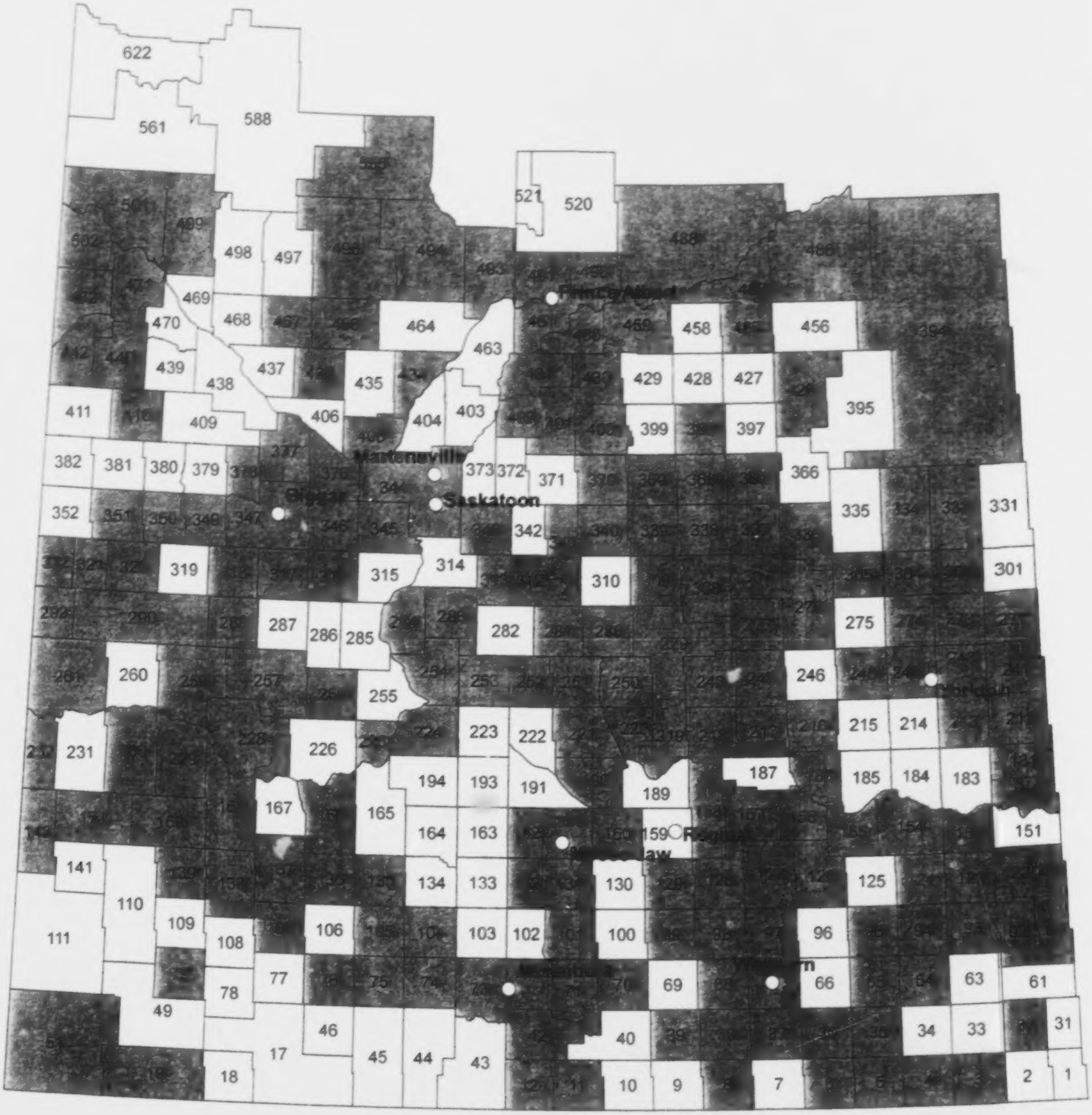
- At a resort, note the lots for sale sign

- On a river bank

- On pasture and rangeland

Municipalities with Appointed Weed Inspectors - 2005

Green: Weed Inspector Appointed
White: Weed Inspector Not Appointed



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SARM Midterm Convention 2005

Appendix 2 Page 62

Saskatchewan Agriculture and Food

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Kilometers

Prepared by:	Geomatics Unit
Data source:	Crop Development Branch
Date:	October 31, 2005

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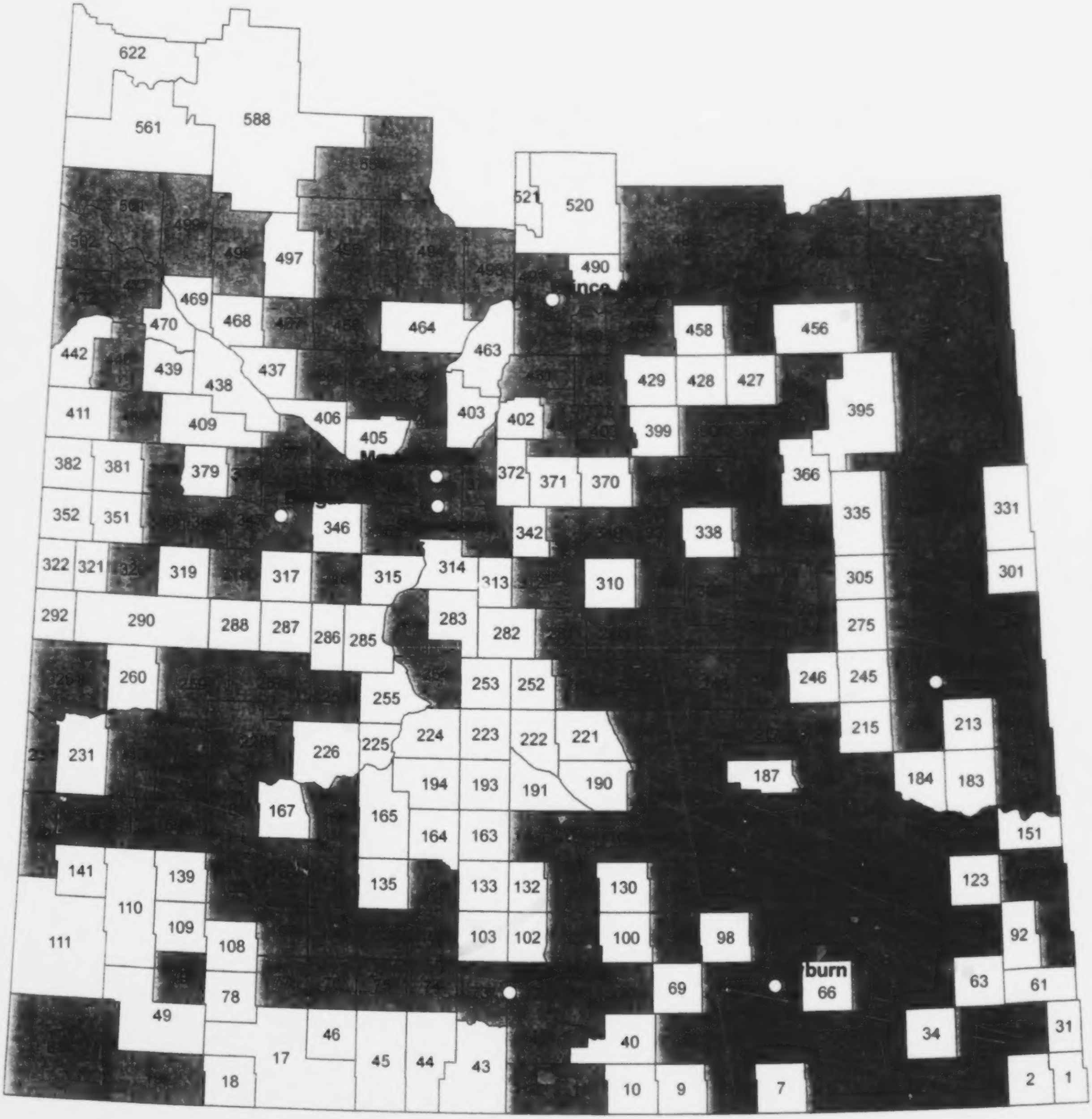
Municipalities with Appointed Weed Inspectors - 2004

Green: Weed Inspector Appointed
White: Weed Inspector Not Appointed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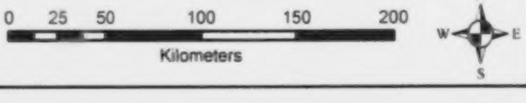
Saskatchewan Agriculture, Food and Rural Revitalization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Prepared by:	Geomatics Unit
Data source:	Crop Development Branch
Date:	March 3, 2005

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Municipalities with Appointed Weed Inspectors - 2005

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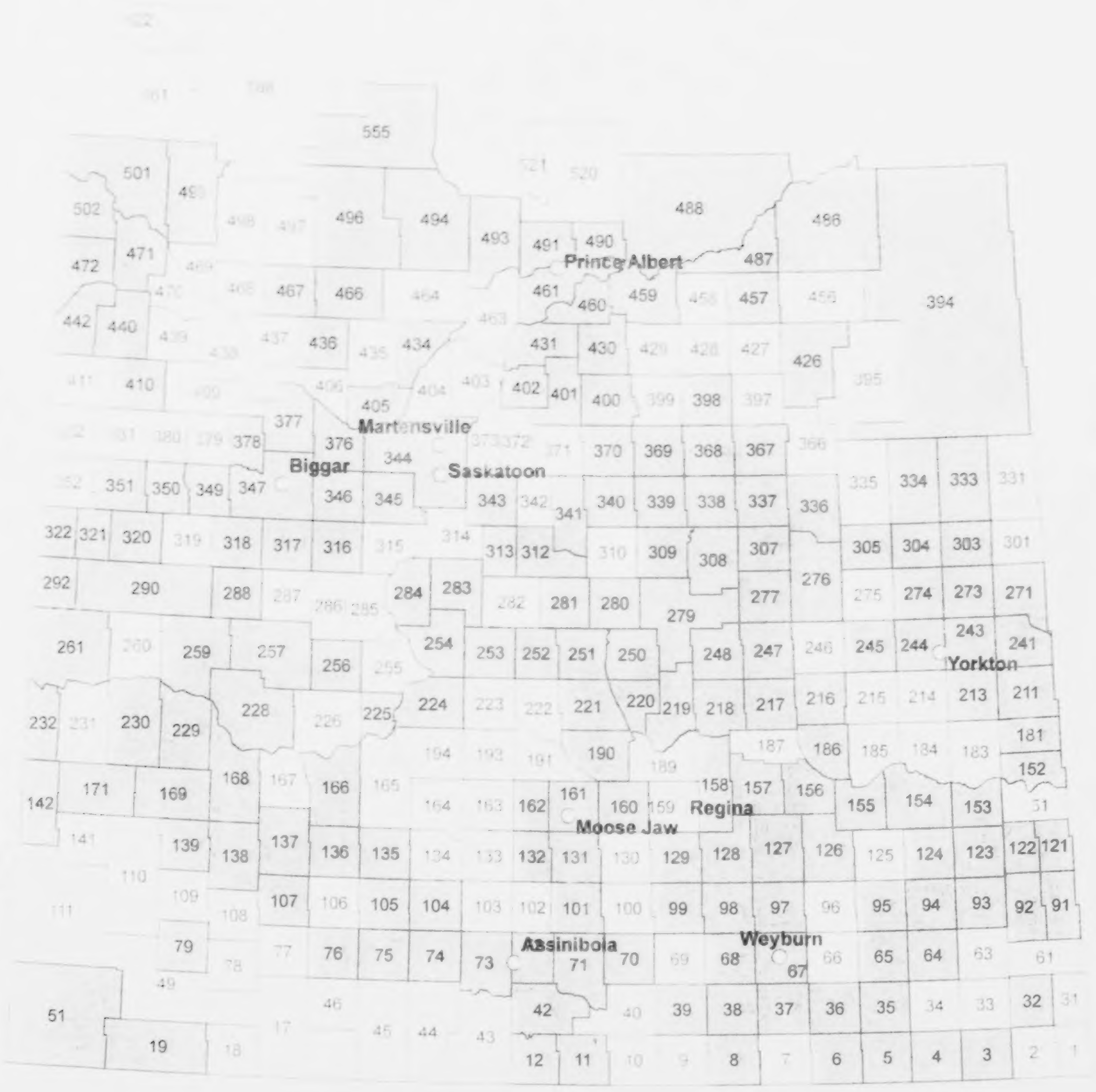
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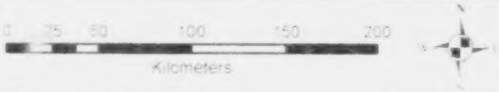
Regina
Assiniboia
Weyburn

Saskatchewan Agriculture and Food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Prepared by:	Geomatics Unit
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Municipalities with Appointed Weed Inspectors - 2004

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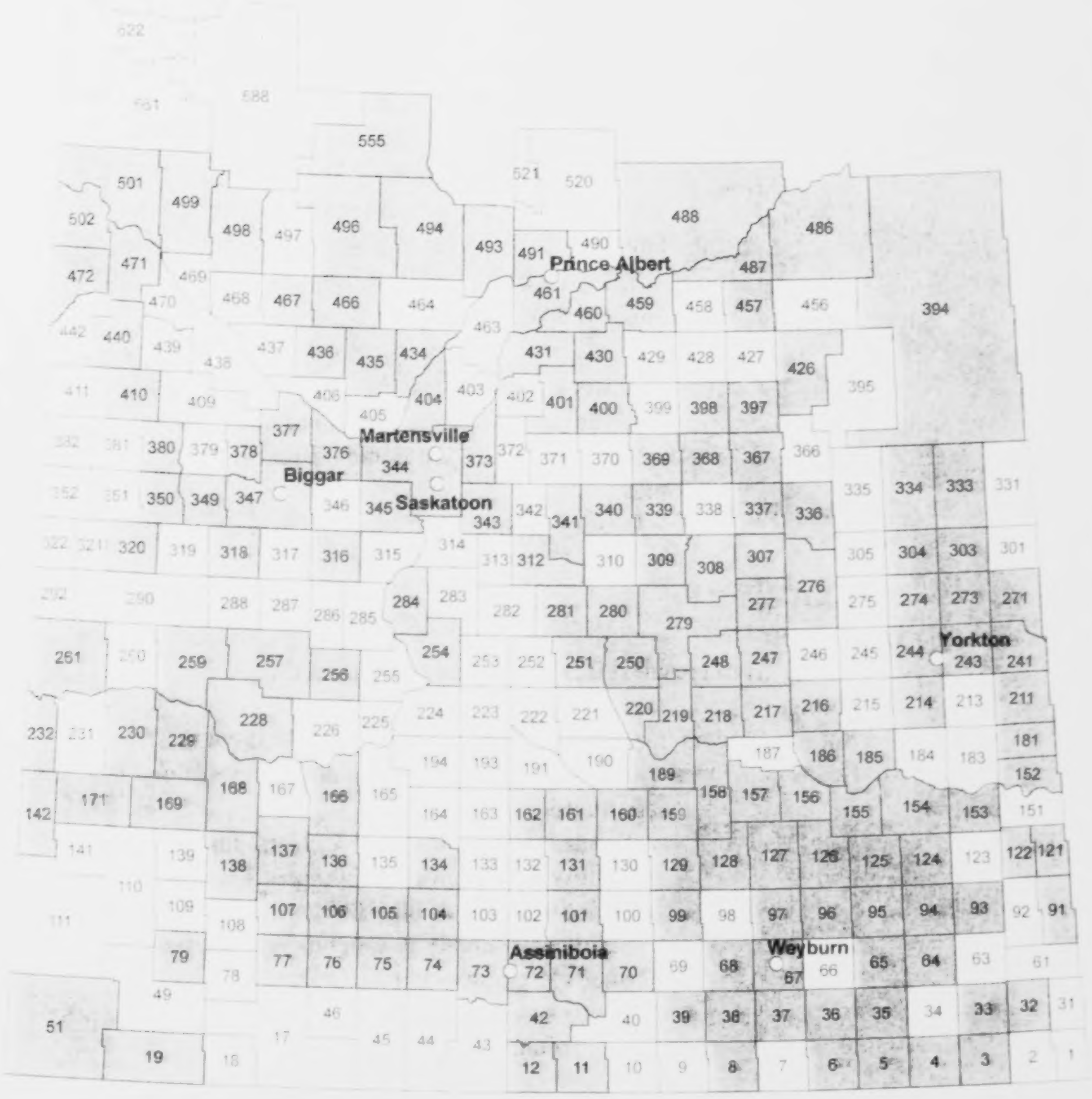
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Saskatchewan Agriculture, Food and Rural Revitalization

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Kilometers

Prepared by:	Geomatics Unit
Data source:	Crop Development Branch
Date:	March 3, 2005

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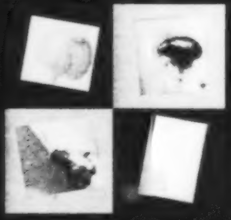


Noxious Weed Program

Leafy Spurge

Biology
Ecology
Management

BIOLOGY AND MANAGEMENT

Habitat

- Dry to moist habitats
- Riverbanks, grasslands, ridges to mountain slopes
- Rough terrain, pastures, rangeland, roadsides and waste areas

Impacts

- Reduces or displaces plant communities
- Reduces recreational and agricultural revenue
- Cost of management is very high

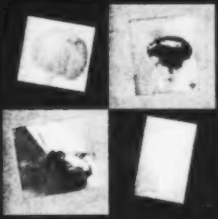
BIOLOGY

Life Cycle

- Grows from crown (buds), roots (buds) and seed in early spring
- Spurge flowers in June and seeds develop 20 – 30 days later
- Seeds can germinate any time soil moisture and temperature is adequate
- Seeds explode, up to 15 ft, from capsules
- A flower may produce 200 seeds with a germination rate of 60 – 80%
- Seeds can spread by humans and animals
- Seeds float on water
- Seeds spread as crop seed and animal feed contaminants

Seedlings

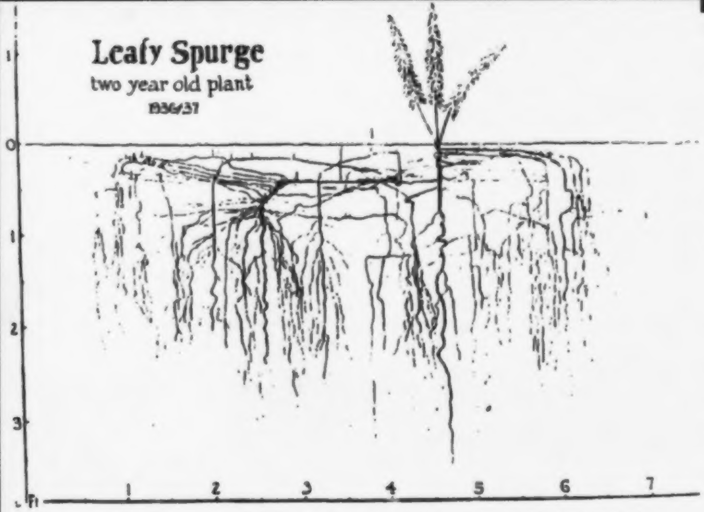
- Develop stem and root buds about 12 days after emergence
- Seedlings can grow downward 3 ft and 40 inches laterally in 4 months



Noxious Weed Program

Leafy Spurge

Biology
Ecology
Management



Leafy spurge Identification and Control, Herbert C. Hanson, 1938. North Dakota Agricultural College Extension Service, Fargo, ND.

Shoots

- Shoots develop from stem and root buds, and seed

Roots

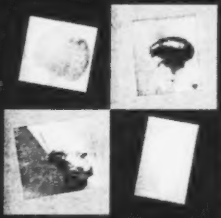
- Root system has vertical and horizontal roots
- Roots can grow 26 ft vertically and 15 ft horizontally per year (U.S. data)

Prevention

- Preventing spurge invasion and establishment is the most effective and least costly management practice
- Avoid importation of roots or seed by machinery, feed or livestock
- Purchase certified seed and weed-free gravel
- Minimize soil disturbance by vehicles, machinery and livestock
- Effectively manage adjacent spurge populations to prevent root spread and seed dispersal
- Manage desired plant communities to encourage continued growth and vigor to suppress spurge invasion, establishment and growth

Early Detection and Rapid Response

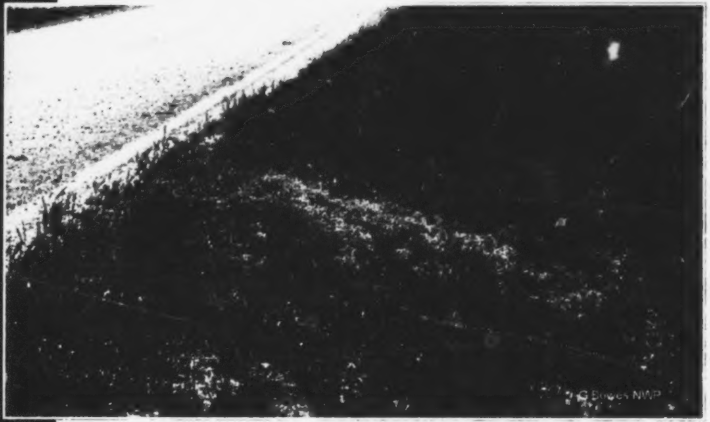
- Protect spurge-free areas from invasion, establishment and growth by frequent and systematic ground surveys



Noxious Weed Program

Leafy Spurge

Biology
Ecology
Management



G Bowes NWP

Small Patches

- Eradicate when spurge is newly established and confined to small, well-defined areas
- Eradication will be unattainable when small patches expand into large infestations
- Neither biological control nor grazing can eradicate small spurge patches
- If seeds have been produced, the site should be monitored for a minimum of eight years

Large Infestations

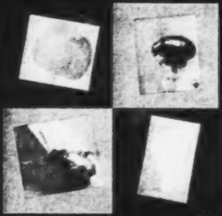
- Management of large spurge infestations must be considered long-term suppression because eradication of the mature root system is not possible
- Make regular visits to monitor treatment effectiveness
- Annually evaluate management efficacy
- When needed use the 4 integrated control methods: physical, cultural, biological and chemical control

PHYSICAL CONTROL

- The use of cultivation, mowing, burning or hand-pulling

Cultivation

- Begin intensive tillage 2 – 4 wks after spurge emerges in the spring and repeat every 3 wks until the soil freezes, for 1 – 2 growing seasons



Mowing and Burning

- Mowing and burning are ineffective for reducing spurge infestations because the weed sprouts from its extensive, deep roots
- Mowing or burning prior to herbicide treatments may provide uniform regrowth for an effective herbicide treatment (Allow at least 5 weeks of regrowth before herbicide application)
- Mowing will reduce seed production if repeated every 2 – 4 wks during the growing season

Pulling by Hand

- Pulling by hand is usually ineffective because the top growth breaks-off and stimulates root buds to produce new shoots from extensive, deep roots

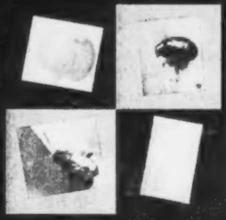
CULTURAL CONTROL

Revegetation

- Seeding aggressive grasses can provide competition with spurge and relative weed-resistance to future invasions

Grazing

- Grazing that allows consistent and heavy selection of desired grasses and avoidance of leafy spurge enhance the success of the weed
- Multi-species grazing that uses sheep or goat grazing encourages equal grazing pressure on all plants across pastures



BIOLOGICAL CONTROL

- Biological control agents will not eradicate spurge, but may reduce populations over time
- Only biological control agents that do not feed on crop and ornamental plants are approved for release in Canada

Black Spurge Flea Beetle, *Aphthona lacertosa*

- Does best on moderately dry to moist sites
- Prefers loamy/loamy-clay soils
- Has broader ecological amplitude than *A. nigriscutis*

Black Dot Spurge Flea Beetle, *Aphthona nigriscutis*

P. Harris AAFC

- Adapted to drier sites and sandier soils than *A. lacertosa*
- Most successful on dry, open, sandy-loam sites
- Performed poorly when released in high density spurge growing on clay soils
- Species has a 85 – 99% female-biased sex ratio
- Collect later in the growing season to ensure mating

CHEMICAL CONTROL

- Because of costs, herbicides are most practical when eradicating small patches and containing moderate infestations
- Because of repeated treatments, chemical control of substantial infestations may be economically unfeasible
- Herbicides registered for use in Canada: 2,4-D amine, dicamba and picloram

MONITORING AND EVALUATING MANAGEMENT

- Monitor for success by repeatedly collecting and analyzing information to evaluate progress
- If management is not effective, then actions should be modified

NOXIOUS WEED PROGRAM

Leafy Spurge Beetles Life Cycle

Keep Your Beetles Safe

Leafy spurge beetles damage the weed mostly by eating the root. There is some damage from foliage feeding.

For the beetles to thrive at a spurge site, they must be able to complete their life cycle.

The beetles are most vulnerable during the adult stage.

Spurge is the only food source that the beetles will eat. Make sure some spurge is growing in July when biocontrol is integrated with sheep and goat grazing or herbicide treatments.

Time sheep and goats rotational grazing in the spring so there will be spurge regrowth in July.

Also, apply 2,4-D early in the spring to allow time for spurge regrowth.

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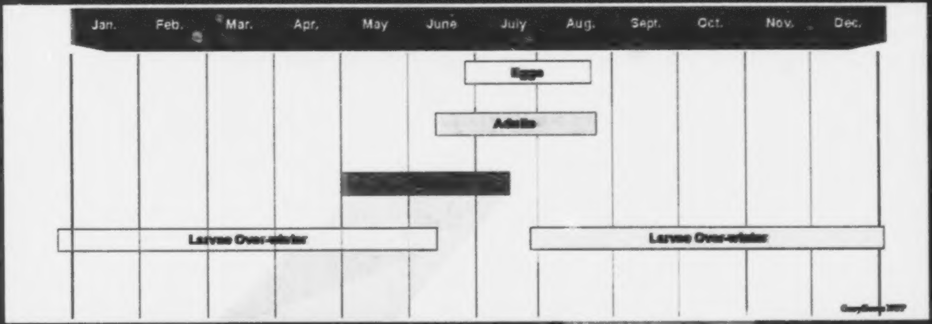

Larva (Spring)	[illegible]	Adults	Eggs	Larva (Fall)
• Feeding resumes when soil temperature rises above 7 C. • Feeding takes place for a number of weeks before pupation.		• Emerge from soil from late spring – early summer • Feed on leaves of leafy spurge • Live 6 to 8 wks.	• Females lay 3 – 15 eggs every 3 – 5 days (220 – 280 eggs) • Hatch after 17 days at 20 C	• Emerge from eggs after 12 – [illegible] days • Feed on roots • Feeding declines when soil temperature falls below 7 C • Requires 180 degree-days above 10 C (~ 75 - 100 days)

NOXIOUS WEED PROGRAM

Leafy Spurge Beetles Life Cycle

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Leafy spurge beetles damage the weed mostly by eating the root. There is some damage from foliage feeding.

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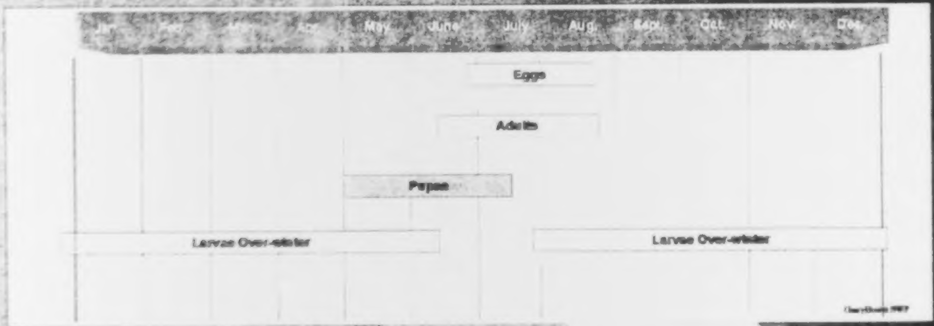
Time sheep and goats rotational grazing in the spring so there will be spurge regrowth in July.

Also, apply 2,4-D early in the spring to allow time for spurge regrowth.

Leafy Spurge Beetles (*Aphthona*) Li



Larva (Spring)	Pupa	Adults	Eggs	Larva (Fall)
• Feeding resumes when soil temperature rises above 7 C • Feeding takes place for a number of weeks before pupation	• 28 – 57 days (spring)	• Emerge from soil from late spring – early summer • Feed on leaves of leafy spurge • Live 6 to 8 wks	• Females lay 3 – 15 eggs every 3 – 5 days (220 – 280 eggs) • Hatch after 17 days at 20 C	• Emerge from eggs after 12 – 19 days • Feed on roots • Feeding declines when soil temperature falls below 7 C • Require 165 degree-days above 10 C (~ 75 - 100 days)

[1] *Aphthona* spp. – [illegible]

[2] Lym, R.G. and D.E. [illegible] Leafy Spurge Control [illegible]

[3] [illegible]

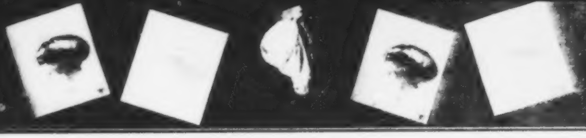
Long Term Leafy Spurge Suppression with Beetles

Noxious Weed Program

Many landowners are not pleased with the control of leafy spurge with flea beetles (*Aphthona* spp). Other landowners are pleased with the beetles. To appreciate why beetles are effective in one area and not in an other area, it is important to understand how the insect controls the noxious weed.

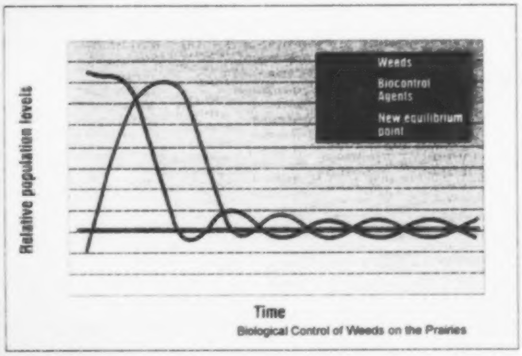
How the Beetles Control (Suppress) Leafy Spurge

The larvae of the Flea Beetle feed on the roots of the weed. Root growth is suppressed. Year by year the roots are destroyed and are unable to supply water and nutrients to the shoots. Gradually, over an unknown number of years, there is a reduction in the number of shoots the plant can support. The above ground growth of spurge is suppressed. The ability of the weed to cover the soil is reduced. Control of spurge by beetles is on-going suppression of the growth of the weed.



Long Term Leafy Spurge Suppression with Beetles

The disappearance of spurge is not continuous year after year. Some years, the environment is more favourable for the growth of spurge and other years the beetles are favoured. There is an equilibrium between the beetles, spurge and the environment.



Biological Control of Weeds on the Prairies

Effective Spurge Control (Suppression)

In North Dakota, the black flea beetle (*Aphthona lacertosa/czwalinae*) reduced the stem density of spurge by 95%⁺ when the weed grew on dry to moist sites with loamy/loamy-clay soils. The black dot flea beetle (*A. nigriscutis*) reduced the stem density of spurge 50 to 70% when the weed grew on dry, open, sandy-loam sites.

Generally, the performance of beetles is poorer in northern areas (Saskatchewan) than in southern areas (southern North Dakota).

Effective Spurge Suppression in Saskatchewan

Unfortunately, in Saskatchewan, most of the large areas with leafy spurge have sandy soils.

Two pasture areas, near Tugaske and Lumsden Beach, were monitored for the effectiveness of beetles to suppress leafy spurge.

Long Term Leafy Spurge Suppression with Beetles

Noxious Weed Program

The density of beetles was measured by counting the number of adults caught in a 14 inch sweep net at a release site. The percent cover of leafy spurge on the soil surface was estimated for each release site.

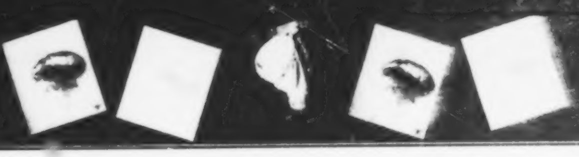
The most difficult part of evaluating beetle performance was selecting an area for assessment. The point of beetles release was located by global positioning equipment which has an error of at least ±3 meters. At the release point, a visual area 5 to 10 m square was selected for measurement. The size of the patch(es) of spurge at the time of release was unknown.

On a pasture near Tugaske, the number of beetles were low in 2001 and 2005. The cover of spurge on the soil surface ranged from 20 to 33%.

Cover of Leafy Spurge on a Co-op Pasture near Tugaske*

Year	Leafy Spurge Beetles/Sweep	Leafy Spurge Cover (%)
2001	3	20
2005	5	33

*Six release sites: Black Dot or Black Flea Beetles were released in 1988, 1989, 1990, 1991, 1996 and 1998



Long Term Leafy Spurge Suppression with Beetles

Noxious Weed Program

Between 1988 to 1998, there were 6 known beetle releases. By 2005, the beetles had spread over the pasture covered with spurge.

It appears that the beetles have thinned out spurge but loss of grazing is high. The soil is sandy. Most of the beetles are black dot. Their performance coincides with the recent research from North Dakota.

Cover of Leafy Spurge on Pastures near Lumsden Beach*

Year	Leafy Spurge Beetles/Sweep	Leafy Spurge Cover (%)
2002	4	30
2003	7	31
2004	6	33
2005	4	55

*Eight release sites: Black Dot or Brown Dot Flea Beetles were released in 1991, 1992 and 2000 (six sites)

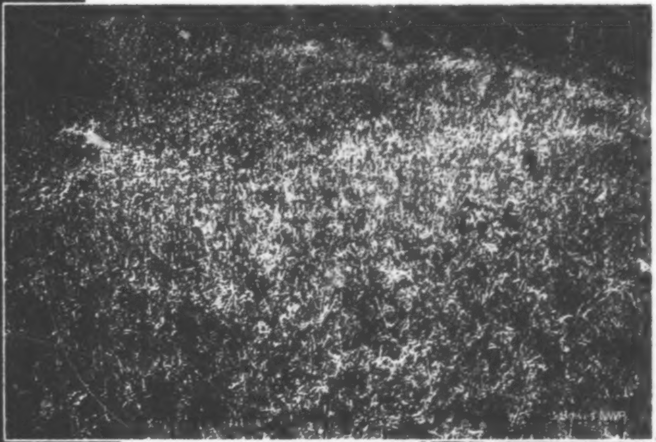
A similar assessment of performance on two pastures near Lumsden Beach showed low beetle numbers per sweep over 4 years. During the same time the cover of spurge was 30 to 33% for 3 years and then increased to 55%. It is speculated that 2005 was a good year for spurge growth and the 55% cover is within the natural equilibrium between the beetles and the weed.

Long Term Leafy Spurge Suppression with Beetles

The soil at the release points is sandy. Most of the beetles at the release sites are black dots.

Given the latest information available on beetle performance from North Dakota, the beetles are performing as expected on pastures with sandy soils. The beetles are thinning spurge stands but cover is too high to meet the expectations of the land users.

In Saskatchewan, black flea beetles do not survive on pastures with spurge growing on sandy soils.



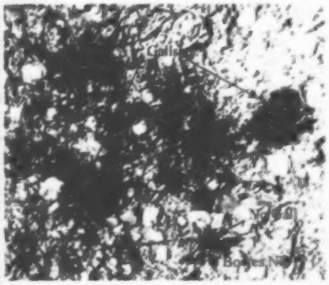
Thinned out spurge at pastures near Tugaske (above) and Lumsden Beach (right).

Scentless Chamomile Gall Midge

Gall Midge Life Cycle

Gall midges alter the growth of scentless chamomile, resulting in shorter less vigorous plants. It is hypothesized that these plants are less competitive.

Gall midges live in galls that form on the foliage of scentless chamomile.



Galls on rosettes

When the snow melts in the spring galls are visible on the rosettes of scentless chamomile.

The midge over winters as a larva or pupa in galls. With the arrival of warm weather, the biocontrol agent grow to the adult stage. Adults exit the over wintered galls and attack rapidly growing scentless chamomile plants in June.

After a minimum of 35 days, the first generation of the midge is complete. The adults exit the galls in July and attack scentless chamomile. This is the start of the second generation.
Adults emerge from the gall during August-September, completing the second generation.

Gall on scentless chamomile in July

Gall on a fall rosette

In September-October adult midges attack rosettes of scentless chamomile. This is the start of the over wintering generation of the midge.

In Europe, a gall has 1 to 80 chambers with one midge per chamber. The average number of eggs contained in a female was 92. With 2 generations per year and an over wintering generation, the midge has the potential to increase quickly.

Scentless Chamomile Gall Midge

In Saskatchewan, midge populations are not increasing quickly because scentless chamomile is often not present.

First, a patch of scentless chamomile is most often found on a site with disturbed vegetation. For rapid midge population growth, a good stand of scentless chamomile must be present for several years. Within 3 to 5 years grasses invade, dominate and scentless chamomile disappears.

Second, the gall midge needs scentless chamomile plants at different stages throughout the growing season. Seeds are produced on plants that are attacked by gall midges. To prevent weed spread by seed, Weed Inspectors control scentless chamomile and when galls are on the plant the midge is killed.

Galls in the fall from which adults have exited

(a) The midges over winter in galls on rosettes on scentless chamomile plants, (b) In the spring bolting plants are attacked and the life cycle is completed during July, (c) In July-August the midges attack rapidly growing plants, (d) In the fall the midges attack rosettes and over winter as in galls

For gall midges to survive and thrive in an area, scentless chamomile plants must grow from spring to fall.

The site in the photograph to the right is an excellent site for rapid increase in the gall midge population. Scentless chamomile plants were available all season for the midge to attack.

NOXIOUS WEED PROGRAM

Best Sites for Seed Weevils and Gall Midges

The scentless chamomile seed weevil and gall midge complete their life cycles in the foliage of the noxious weed.

If the biocontrol agents are going to proliferate in an area, the agents and the weed must be left alone in a secure site.

When scentless chamomile is left alone during a growing season the plant will set viable seed.

Disappearing Scentless Chamomile

Scentless chamomile grows with disturbed vegetation or along the edge of permanent vegetation. Preferred areas are those with excess moisture.

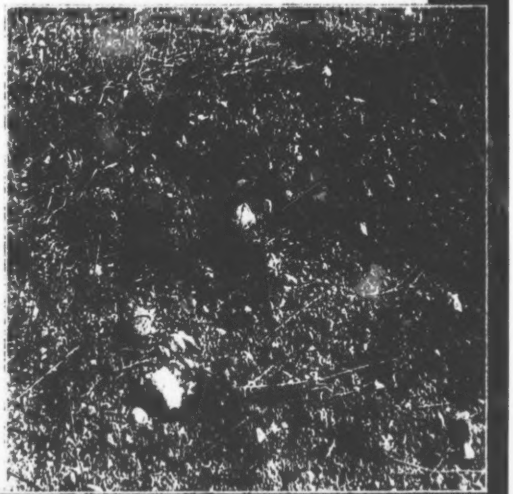
Scentless chamomile can grow with brome. When this is observed take a close look at the site. A minor disturbance of the sod is sufficient for the growth of scentless chamomile. After 3 to 5 years of no disturbance, scentless chamomile will disappear.

When scentless chamomile disappears from a site, so do the seed weevils and the gall midges.

Good Sites for the Growth of Scentless Chamomile

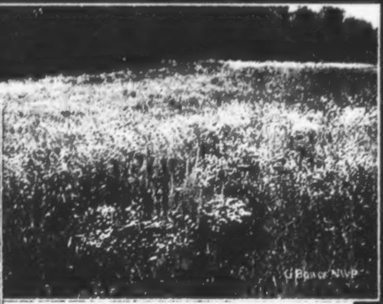
Gravel Pit

A good site for the growth of scentless chamomile is an abandoned gravel pit. The gravel-soil is good for the growth of scentless chamomile but poor for the growth of grasses. Grasses like brome will invade but it takes many years for a sod to form over the entire area.



NOXIOUS WEED PROGRAM

Best Sites for Seed Weevils and Gall Midges



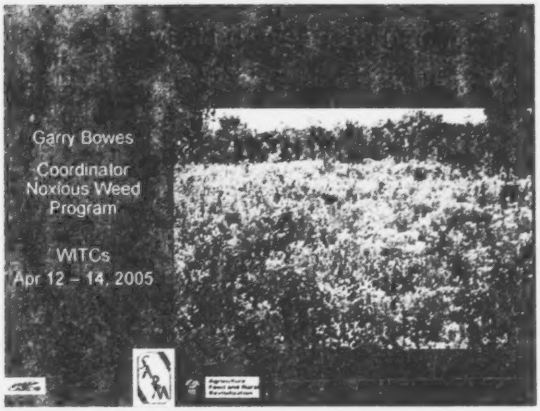
Soil Mounds

Scentless chamomile can grow every year for many years in a permanent grass-alfalfa area that is not grazed or cut for hay. For scentless chamomile to grow successfully, there needs to be a disturbance. Mounds of soil from burrowing animals are sufficient for the growth of scentless chamomile, provided seed of the weed is in the soil. Gradually, grasses will invade the mounds and scentless chamomile will disappear in about 3 years. By this time other mounds of soil will support the growth of the weed. Adult seed weevils and gall midges are mobile and will move to the new patches of the weed.

Landfill

The continuous disposal of refuse at landfills causes sufficient disturbance of the vegetation to support the continuous growth of scentless chamomile. While the growth of scentless chamomile is excellent on the road up the hill and at the dump site, the weed should be controlled with a herbicide to prevent spread. Scentless chamomile growing at bottom of the dump site is sufficient to support the continuous growth of the weed with bio-control agents.

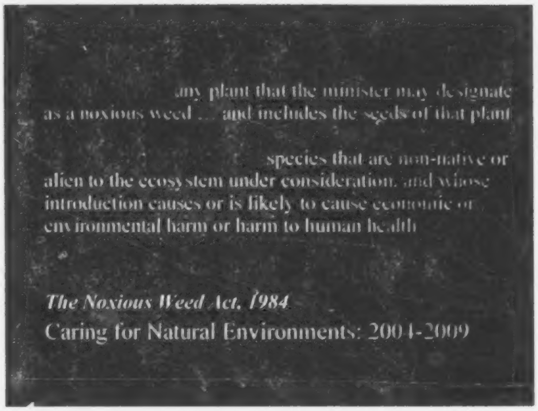
For the survival and increase in the populations of seed weevils and gall midges, scentless chamomile must always be present.



Garry Bowes

Coordinator
Noxious Weed
Program

WITCs
Apr 12 – 14, 2005



any plant that the minister may designate as a noxious weed … and includes the seeds of that plant

species that are non-native or alien to the ecosystem under consideration, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health

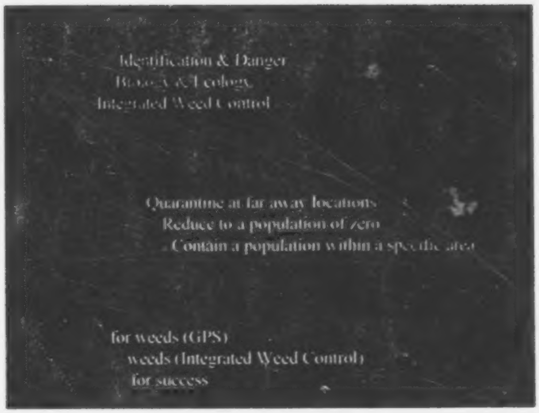
The Noxious Weed Act, 1984

Caring for Natural Environments: 2004-2009

Patches, green yellow bracts
Latex, deep roots

Dominates (invades) pastures and native communities
Cattle refuse to eat

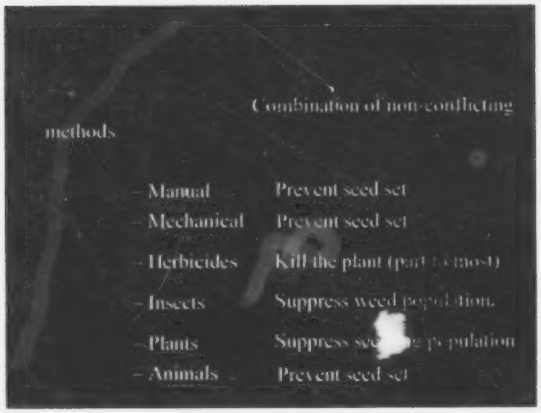
Lateral root spread 1-6 ft/yr
Seed catapult 15 ft (new satellite infestation)
Human, animal assisted (new infestation)



Identification & Danger
Biology & Ecology
Integrated Weed Control

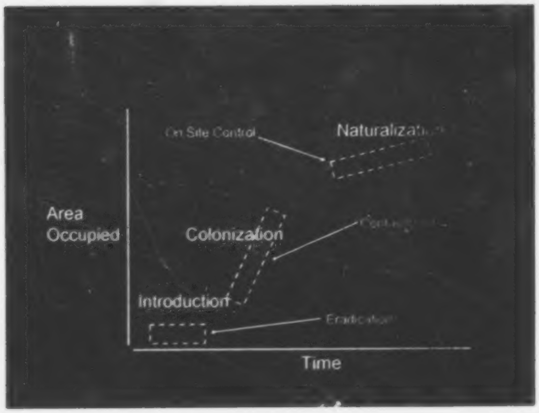
Quarantine at far away locations
Reduce to a population of zero
Contain a population within a specific area

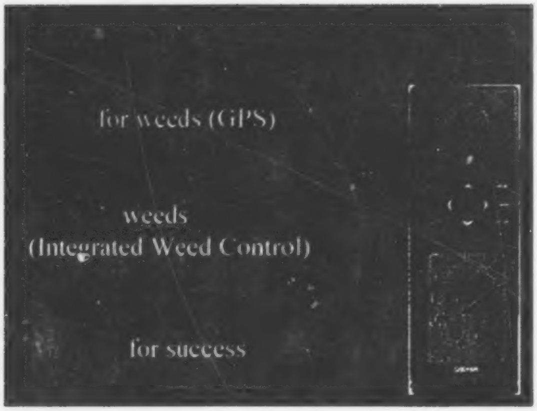
for weeds (GPS)
weeds (Integrated Weed Control)
for success



Combination of non-conflicting methods

– Manual	Prevent seed set
– Mechanical	Prevent seed set
– Herbicides	Kill the plant (part to most)
– Insects	Suppress weed population
– Plants	Suppress see[illegible]g population
– Animals	Prevent seed set




for weeds (GPS)

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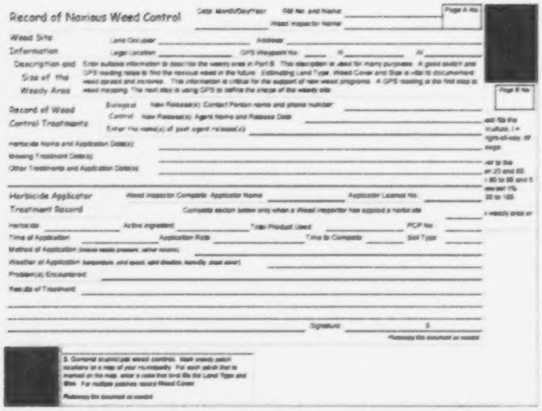
(Integrated Weed Control)

for success


Record of Noxious Weed Control

Date Month/Day/Year

Weed Inspector Name

Weed Site Information

Land Occupier

Address

Legal Location

GPS Waypoint No.

N

W

Description and Size of the Weedy Area

Record of Weed Control Treatments

Biological Control

New Release(s): Contact Person name and phone number

New Release(s): Agent Name and Release Date

Enter the name(s) of pest agent released(s)

Herbicide Name and Application Date(s)

Mowing Treatment Date(s)

Other Treatments and Application Date(s)

Herbicide Applicator Treatment Record

Weed Inspector Complete: Applicator Name

Applicator License No.

Complete section below only when a Weed Inspector has applied a herbicide

Herbicide

Active ingredient

Total Product Used

PCP No.

Time of Application

Application Rate

Time to Complete

Soil Type

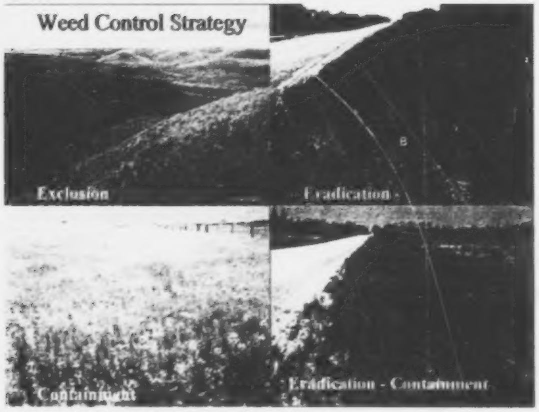
Method of Application

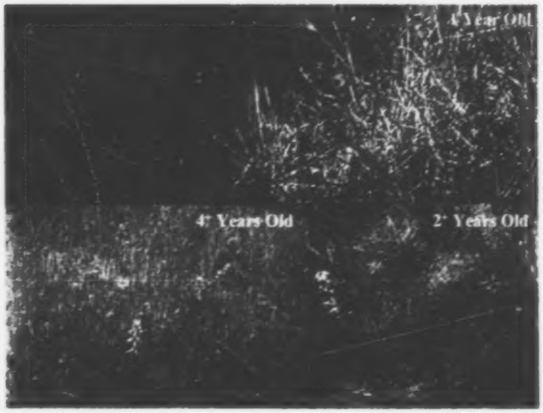
Weather at Application

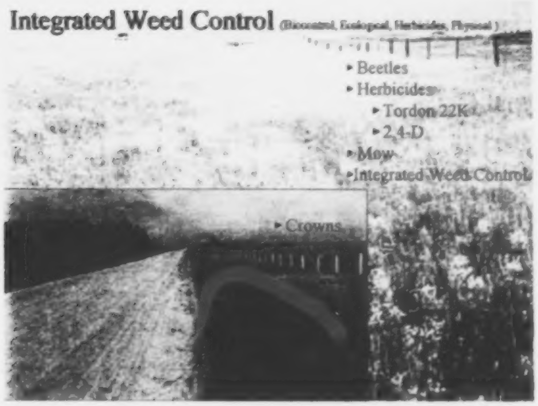
Problem(s) Encountered

Results of Treatment

Signature


Weed Control Strategy



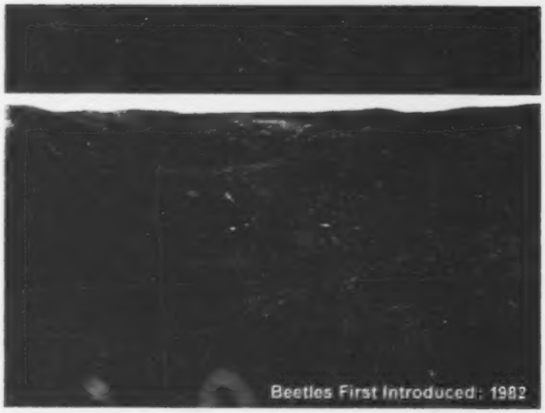

Integrated Weed Control (Biocontrol, Ecological, Herbicides, Physical)

- Beetles
- Herbicides
  - Tordon 22K
  - 2,4-D
- Mow
- Integrated Weed Control
- Crowns

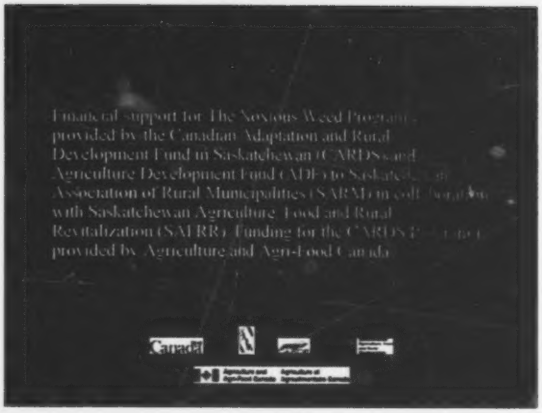
Weed Control Strategy:

Exclusion, Eradication & Containment: Border

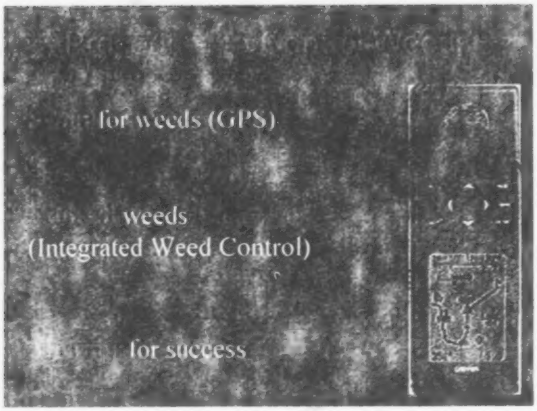
ocontrol



Beetles First Introduced: 1982



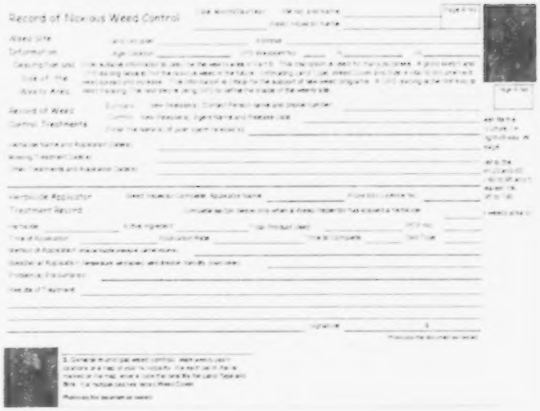
Financial support for The Noxious Weed Program is provided by the Canadian Adaptation and Rural Development Fund in Saskatchewan (CARDS) and Agriculture Development Fund (ADF) to Saskatchewan Association of Rural Municipalities (SARM) in collaboration with Saskatchewan Agriculture, Food and Rural Revitalization (SAFRR). Funding for the CARDS [illegible] provided by Agriculture and Agri-Food Canada.



for weeds (GPS)

weeds
(Integrated Weed Control)

for success

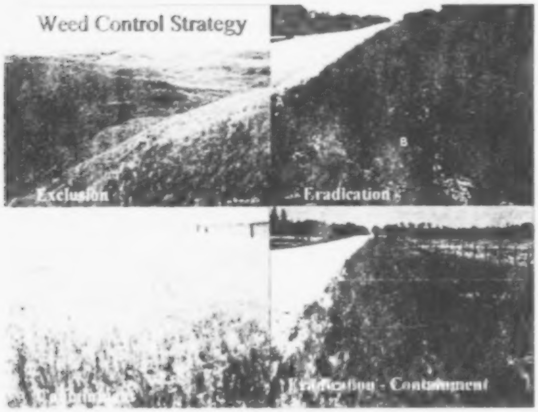


Record of Noxious Weed Control

Weed Site
Information

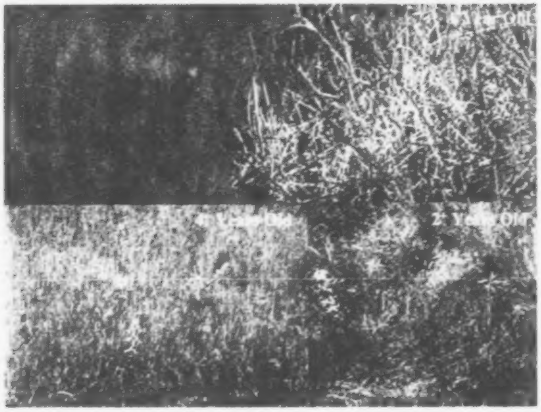
Record of Weed
Control Treatments

Herbicide Application
Treatment Record

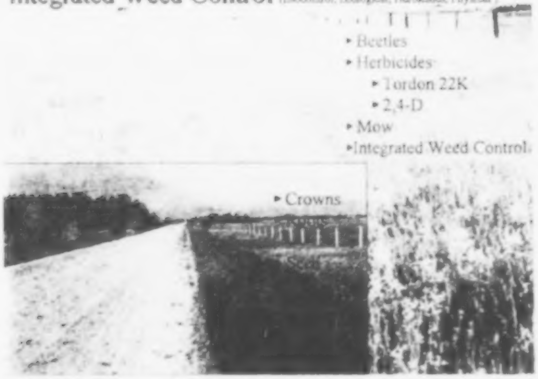


Weed Control Strategy

Exclusion
A
B
Eradication
Eradication - Containment



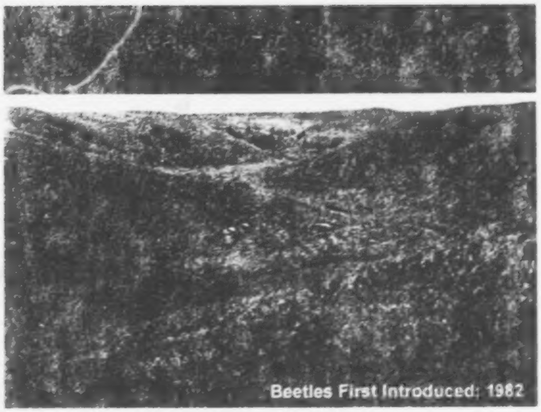
Integrated Weed Control (Biocontrol, Ecological, Herbicides, Physical)



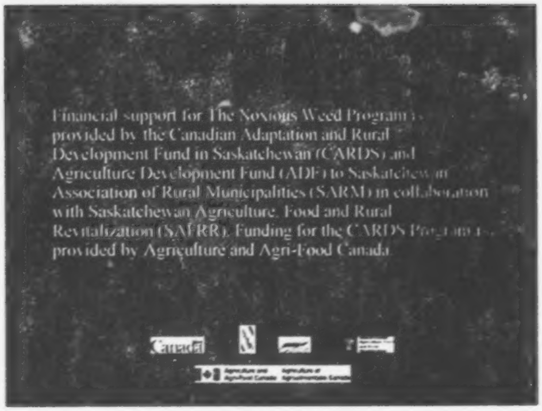
- Beetles
- Herbicides
  - Tordon 22K
  - 2,4-D
- Mow
- Integrated Weed Control
- Crowns

Weed Control Strategy:

Exclusion, Eradication & Containment: **Border**



Beetles First Introduced: 1982



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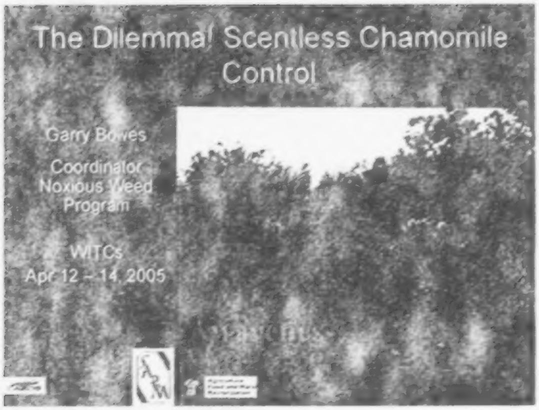
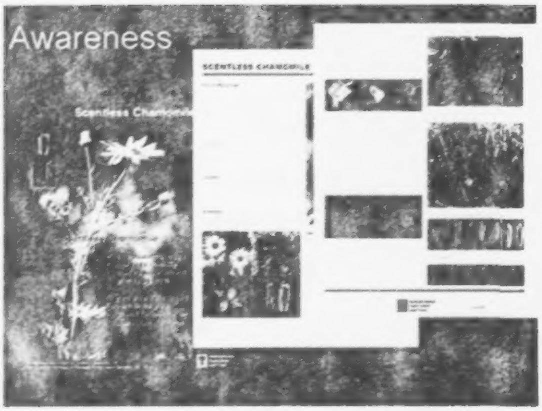


The Dilemma! Scentless Chamomile Control

Garry Bowes

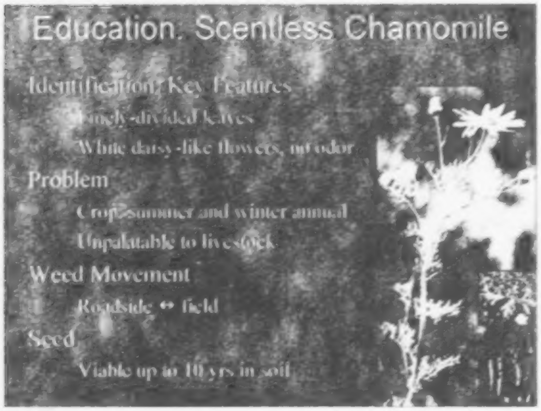
Coordinator
Noxious Weed Program

WITCs
Apr 12 – 14, 2005



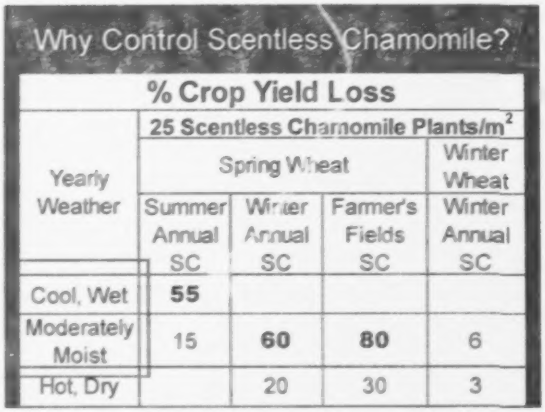
Awareness

Scentless Chamomile
SCENTLESS CHAMOMILE



Education. Scentless Chamomile

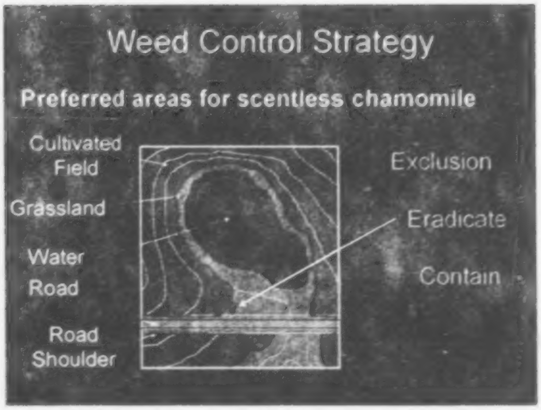
- Identification: Key Features
  - Finely-divided leaves
  - White daisy-like flowers, no odor
- Problem
  - Crop: summer and winter annual
  - Unpalatable to livestock
- Weed Movement
  - Roadside ↔ field
- Seed
  - Viable up to 10 yrs in soil



Why Control Scentless Chamomile?

% Crop Yield Loss

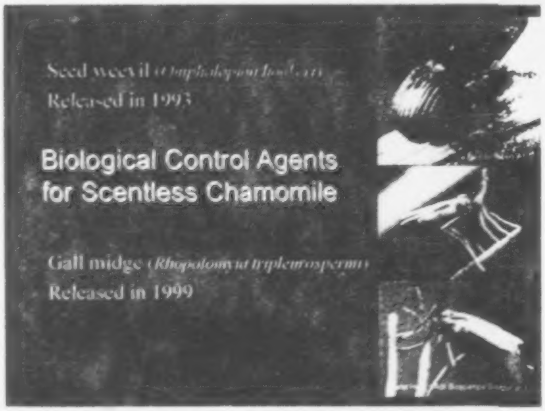
Yearly Weather	**25 Scentless Chamomile Plants/m²**			
	Spring Wheat			Winter Wheat
	Summer Annual SC	Winter Annual SC	Farmer's Fields SC	Winter Annual SC
Cool, Wet	**55**			
Moderately Moist	15	**60**	**80**	6
Hot, Dry		20	30	3



Weed Control Strategy

Preferred areas for scentless chamomile

Cultivated Field
Grassland
Water
Road
Road Shoulder
Exclusion
Eradicate
Contain



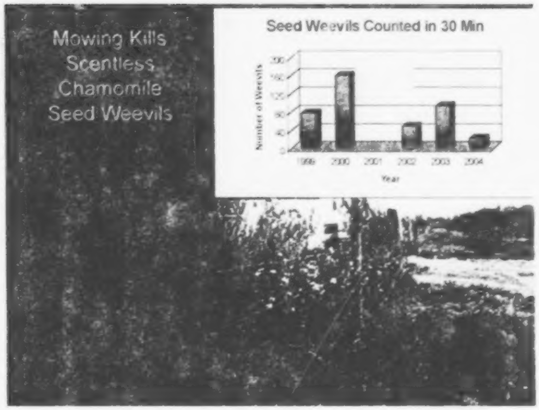
Seed weevil (*Omphalapion hookeri*)
Released in 1993

Biological Control Agents for Scentless Chamomile

Gall midge (*Rhopalomyia tripleurospermi*)
Released in 1999

Scentless Chamomile Seed Weevil

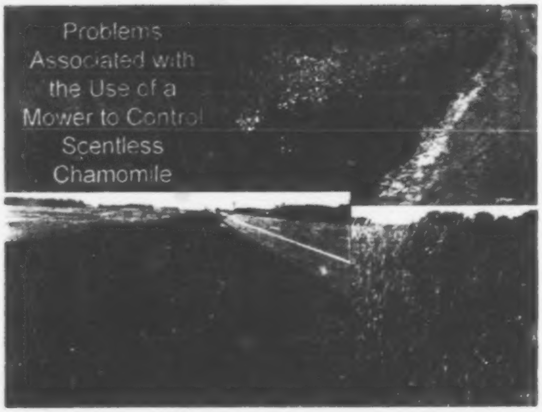
Omphalapion hookeri



Mowing Kills Scentless Chamomile Seed Weevils

Mowing Kills Scentless Chamomile Gall Midges

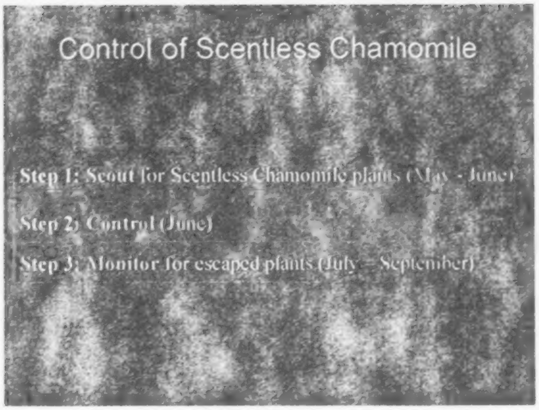
Healthy Stands of Grass for Scentless Chamomile Control



Problems Associated with the Use of a Mower to Control Scentless Chamomile

Suitable Sites for Scentless Chamomile Seed Weevil and Gall Midge Releases

Seed weevils can travel [illegible] and gall midges can travel [illegible]

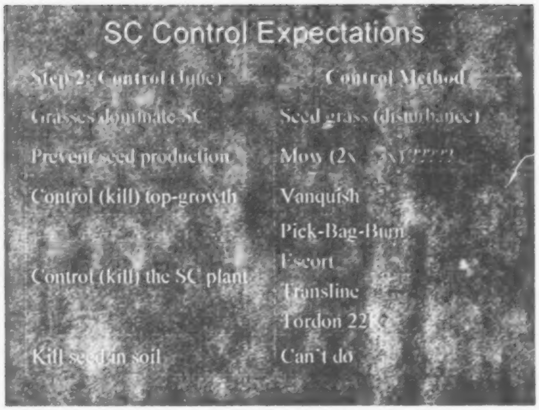


Control of Scentless Chamomile

Step 1: Scout for Scentless Chamomile plants (May – June)

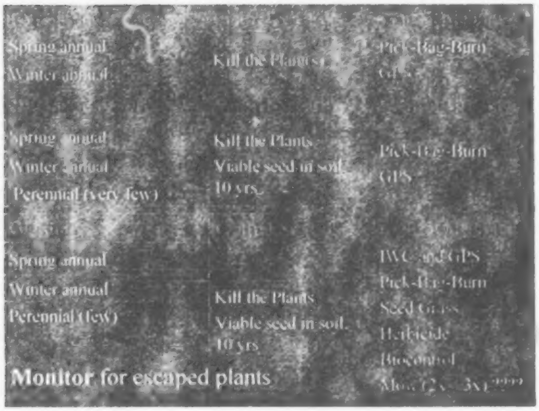
Step 2: Control (June)

Step 3: Monitor for escaped plants (July – September)



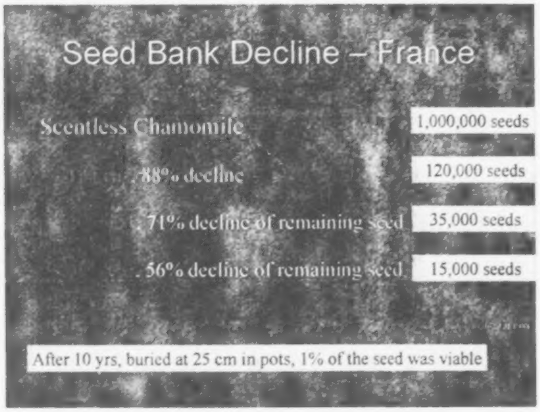
SC Control Expectations

Step 2: Control (June)	Control Method
Grasses dominate SC	Seed grass (disturbance)
Prevent seed production	Mow (2x – 3x)?????
Control (kill) top-growth	Vanquish Pick-Bag-Burn
Control (kill) the SC plant	Escort Transline Tordon 22K
Kill seed in soil	Can`t do



Spring annual Winter annual	Kill the Plants	Pick-Bag-Burn GPS
Spring annual Winter annual Perennial (very few)	Kill the Plants Viable seed in soil 10 yrs.	Pick-Bag-Burn GPS
Spring annual Winter annual Perennial (few)	Kill the Plants Viable seed in soil 10 yrs	IWC and GPS Pick-Bag-Burn Seed Grass Herbicide Biocontrol Mow (2x – 3x)????

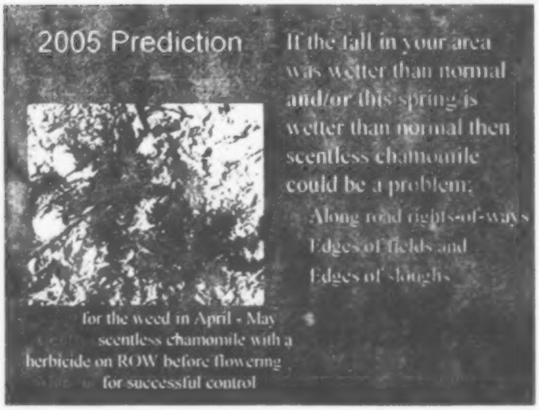
Monitor for escaped plants



Seed Bank Decline – France

Scentless Chamomile	1,000,000 seeds
88% decline	120,000 seeds
71% decline of remaining seed	35,000 seeds
56% decline of remaining seed	15,000 seeds

After 10 yrs, buried at 25 cm in pots, 1% of the seed was viable



2005 Prediction

If the fall in your area was wetter than normal and/or this spring is wetter than normal then scentless chamomile could be a problem;

- Along road rights-of-ways
- Edges of fields and
- Edges of sloughs

for the weed in April - May
scentless chamomile with a herbicide on ROW before flowering
for successful control

Acknowledgements

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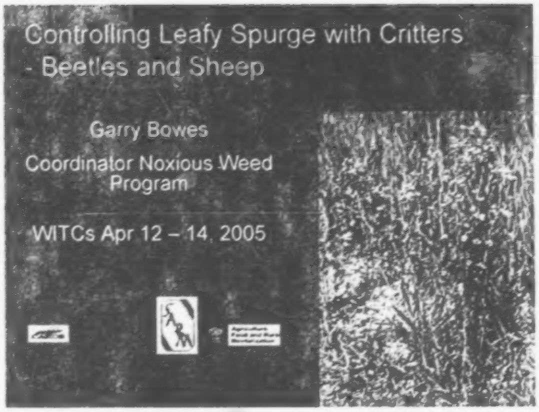
Biocontrol

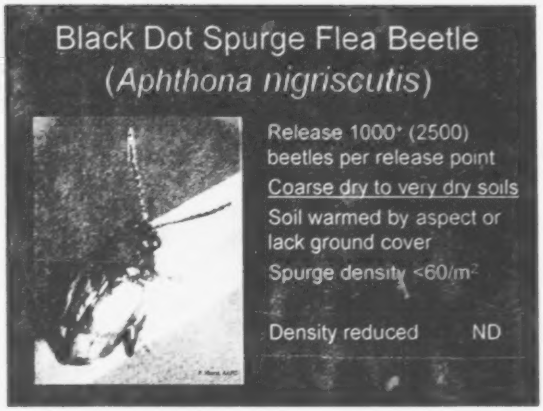


Controlling Leafy Spurge with Critters - Beetles and Sheep

Garry Bowes

Coordinator Noxious Weed Program

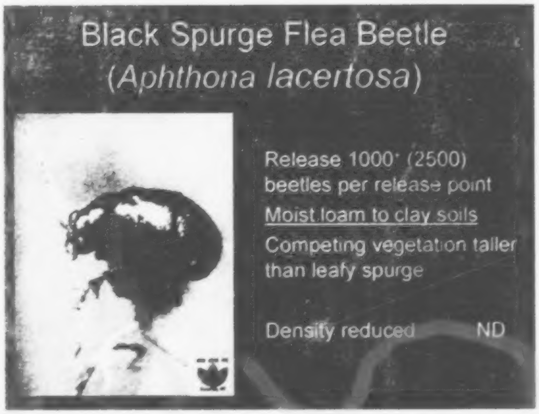
WITCs Apr 12 – 14, 2005



Black Dot Spurge Flea Beetle (*Aphthona nigriscutis*)

- Release 1000^{+} (2500) beetles per release point
- Coarse dry to very dry soils
- Soil warmed by aspect or lack ground cover
- Spurge density $<60/m^2$

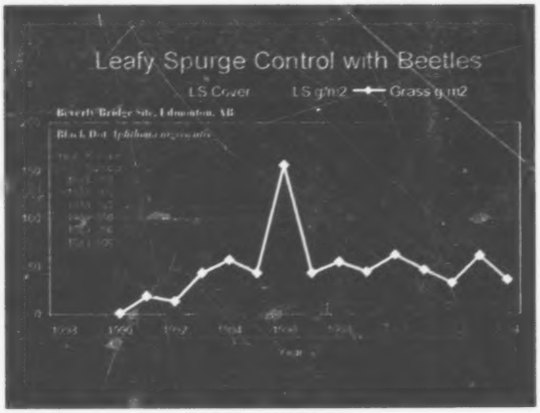
Density reduced ND



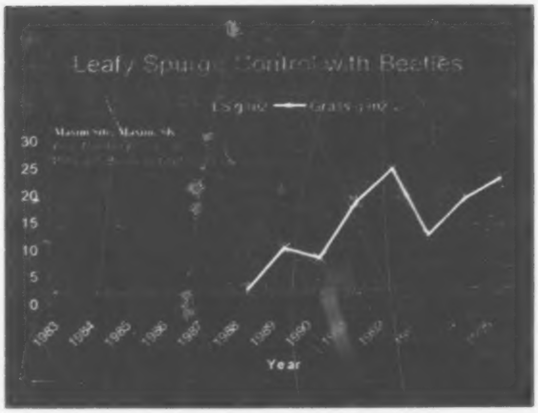
Black Spurge Flea Beetle (*Aphthona lacertosa*)

- Release 1000^{+} (2500) beetles per release point
- Moist loam to clay soils
- Competing vegetation taller than leafy spurge

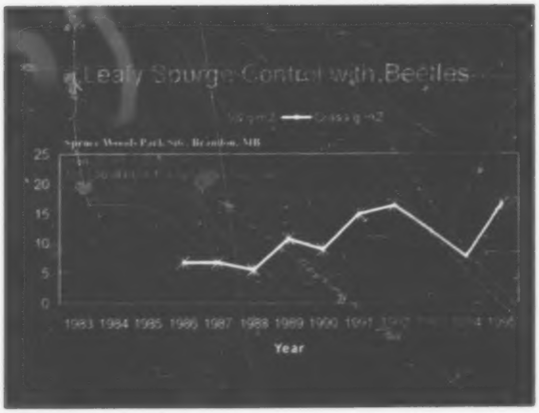
Density reduced ND



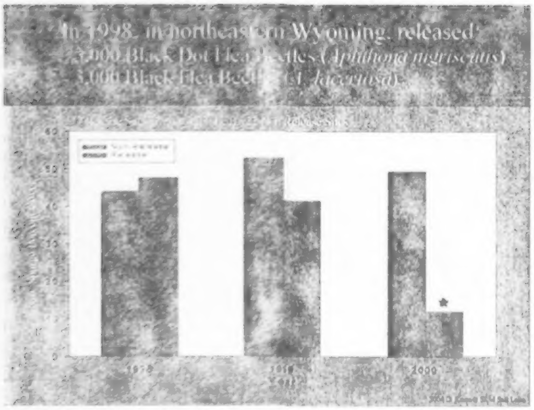
Leafy Spurge Control with Beetles



Leafy Spurge Control with Beetles

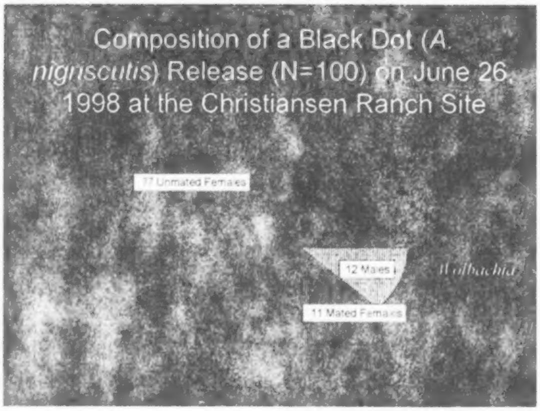


Leafy Spurge Control with Beetles

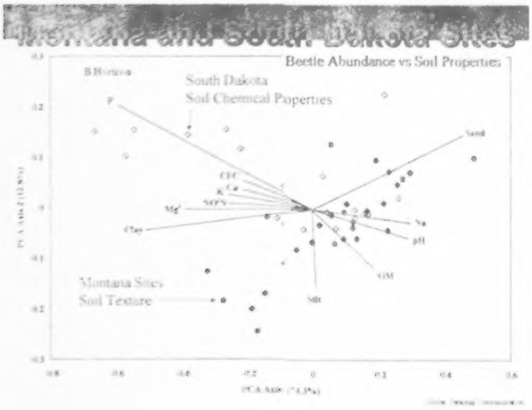


In 1998, in northeastern Wyoming, released:

- ?,000 Black Dot Flea Beetles (*Aphthona nigriscutis*)
- 3,000 Black Flea Beetles (*A. lacertosa*)

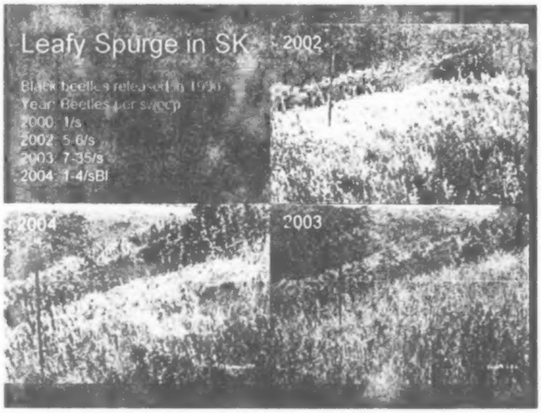


Composition of a Black Dot (*A. nigriscutis*) Release (N=100) on June 26, 1998 at the Christiansen Ranch Site



Montana and South Dakota Sites

Beetle Abundance vs Soil Properties



Leafy Spurge in SK

Black beetles released in [illegible]

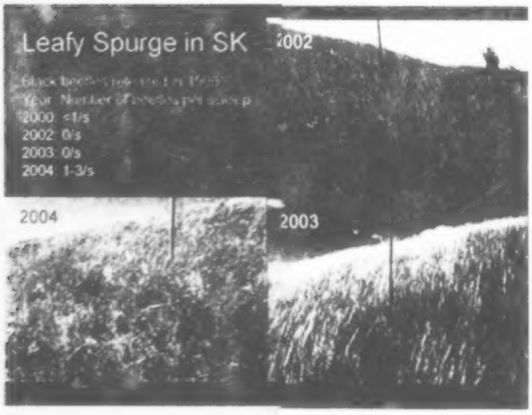
Year: Beetles per sweep

2000: 1/s

2002: 5-6/s

2003: 7-35/s

2004: 1-4/sBl



Leafy Spurge in SK

Black beetles released in [illegible]

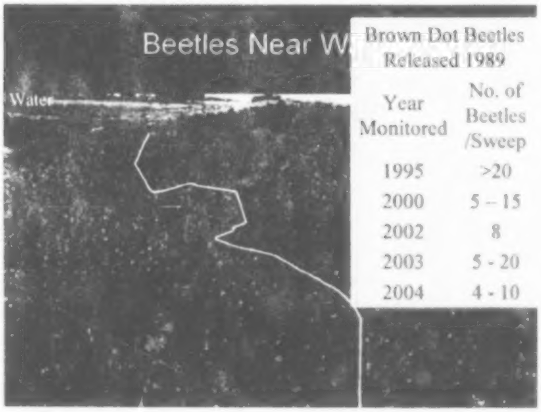
Year: Number of beetles per sweep

2000: <1/s

2002: 0/s

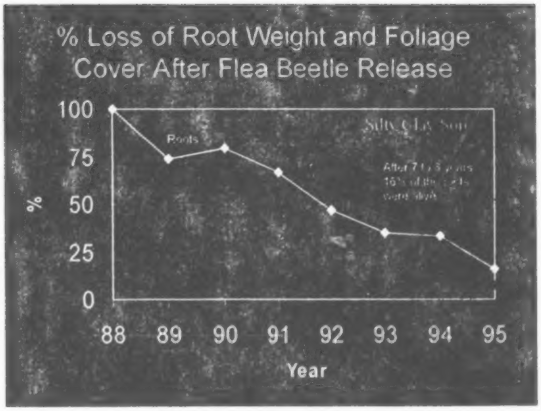
2003: 0/s

2004: 1-3/s

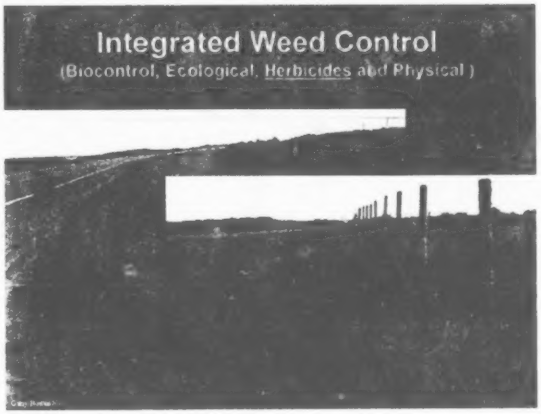


Beetles Near W

Brown Dot Beetles Released 1989	
Year Monitored	No. of Beetles /Sweep
1995	>20
2000	5 – 15
2002	8
2003	5 - 20
2004	4 - 10

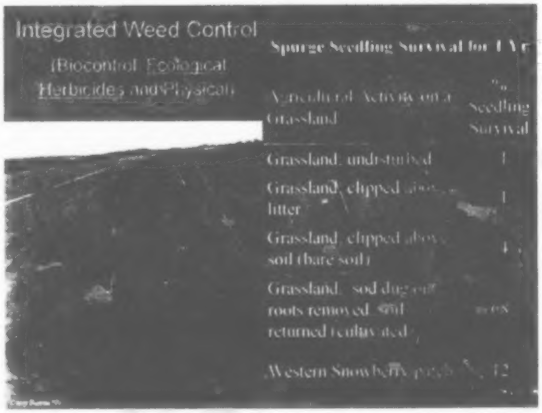


1
2
3
4
Collect
and
Release
5
7
8
9



Integrated Weed Control

(Biocontrol, Ecological, Herbicides and Physical)

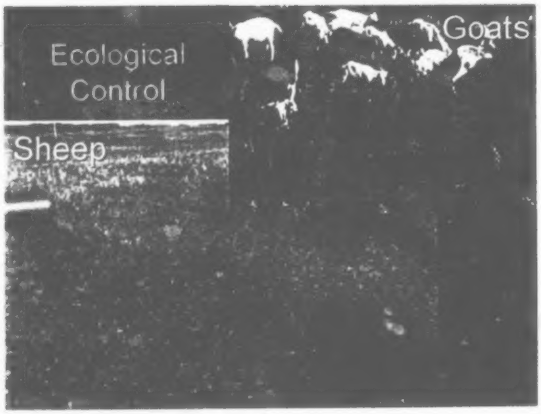


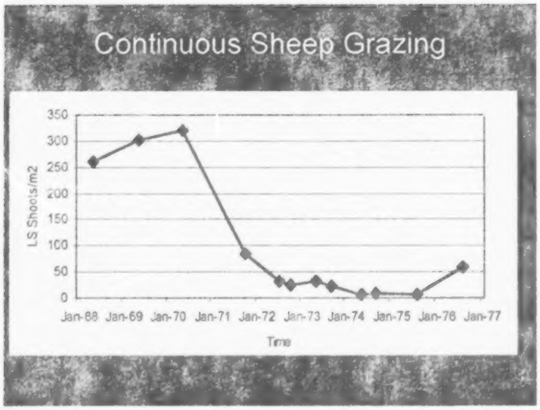
Integrated Weed Control

(Biocontrol, Ecological, Herbicides and Physical)

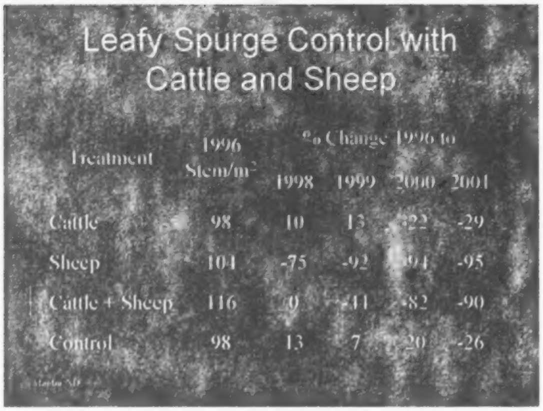
Spurge Seedling Survival for 1 Yr

Agricultural Activity on a Grassland	% Seedling Survival
Grassland, undisturbed	1
Grassland, clipped above litter	1
Grassland, clipped above soil (bare soil)	4
Grassland, sod dug out, roots removed, soil returned (cultivated)	[illegible]68
Western Snowberry patch	12


Ecological
Control
Goats
Sheep



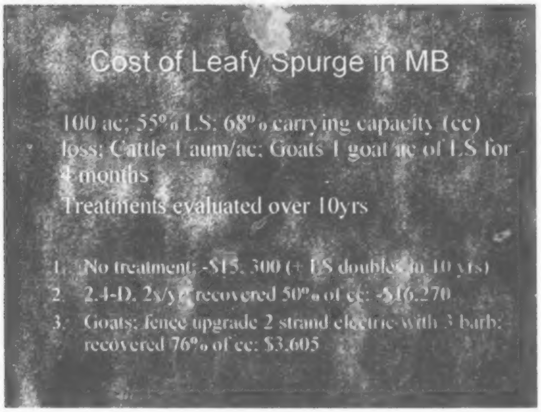
Continuous Sheep Grazing



Leafy Spurge Control with Cattle and Sheep

Treatment	1996 Stem/m^2	% Change 1996 to			
		1998	1999	2000	2001
Cattle	98	10	13	-22	-29
Sheep	104	-75	-92	-94	-95
Cattle + Sheep	116	0	-41	-82	-90
Control	98	13	7	-20	-26

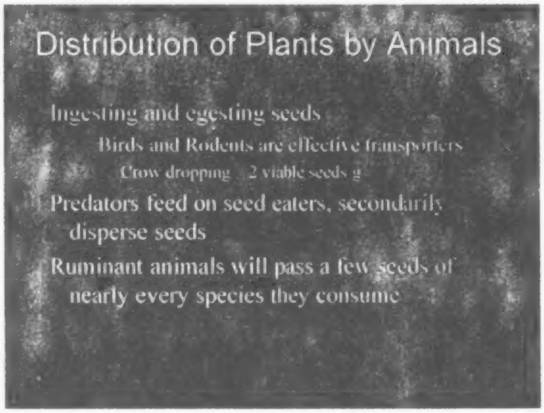
[illegible]



Cost of Leafy Spurge in MB

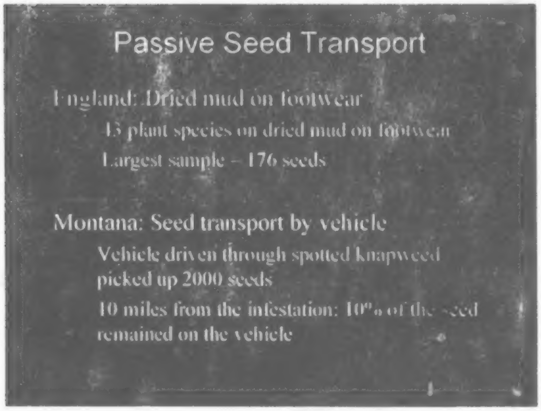
- 100 ac; 55% LS; 68% carrying capacity (cc) loss; Cattle 1 aum/ac; Goats 1 goat/ac of LS for 4 months
- Treatments evaluated over 10yrs

1. No treatment: -$15, 300 (+ LS doubles in 10 yrs)
2. 2,4-D, 2x/yr; recovered 50% of cc: -$16,270
3. Goats: fence upgrade 2 strand electric with 3 barb; recovered 76% of cc: $3,605



Distribution of Plants by Animals

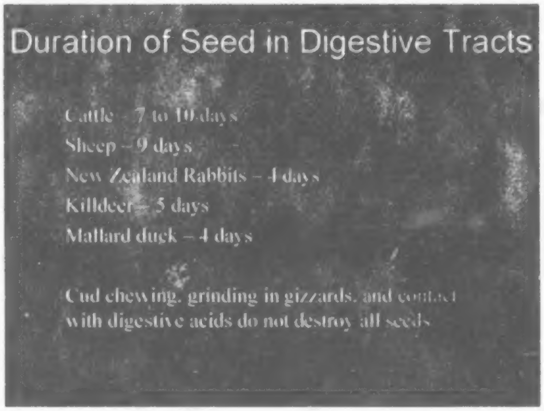
- Ingesting and egesting seeds
  - Birds and Rodents are effective transporters
    - Crow dropping 2 viable seeds g
- Predators feed on seed eaters, secondarily disperse seeds
- Ruminant animals will pass a few seeds of nearly every species they consume



Passive Seed Transport

- England: Dried mud on footwear
  - 13 plant species on dried mud on footwear
  - Largest sample – 176 seeds

- Montana: Seed transport by vehicle
  - Vehicle driven through spotted knapweed picked up 2000 seeds
  - 10 miles from the infestation: 10% of the seed remained on the vehicle



Duration of Seed in Digestive Tracts

- Cattle – 7 to 10 days
- Sheep – 9 days
- New Zealand Rabbits – 4 days
- Killdeer – 5 days
- Mallard duck – 4 days

- Cud chewing, grinding in gizzards, and contact with digestive acids do not destroy all seeds

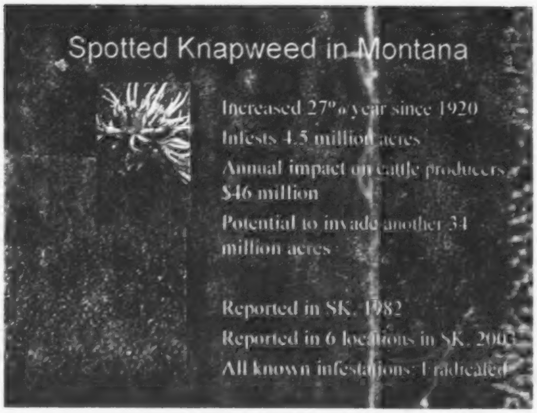
Weed Management Area (WMA)

A local organization that brings together owners of private land, industrial land users and land managers responsible for city, provincial and federal lands to manage a common weed problem

- Include Weed Inspector (use Noxious Weed Act)
- A stand-alone organization or part of an ADD Board
- Memorandum of understanding (MOU)

Start with a Steering Committee → WMA

- Establish long term goals and objectives
- A Management Plan (MP)
- An Annual Operating Plan (AOP)



Spotted Knapweed in Montana

Increased 27%/year since 1920

Infests 4.5 million acres

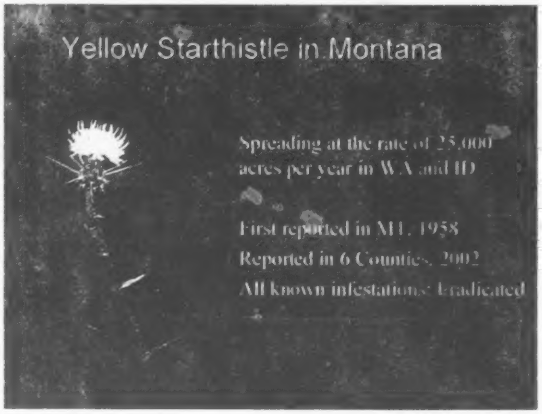
Annual impact on cattle producers $46 million

Potential to invade another 34 million acres

Reported in SK, 1982

Reported in 6 locations in SK, 2003

All known infestations: Eradicated



Yellow Starthistle in Montana

Spreading at the rate of 25,000 acres per year in WA and ID

First reported in MT, 1958

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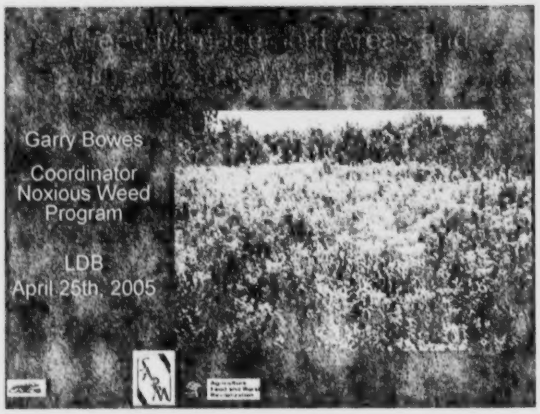
Canada

Agriculture and Agri-Food Canada Agriculture et Agroalimentaire Canada

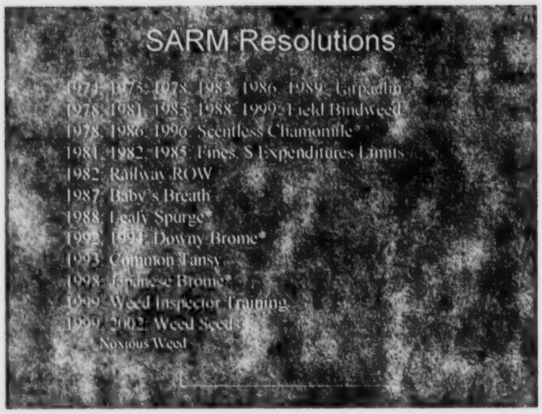


[illegible]

Garry Bowes

Coordinator
Noxious Weed
Program

LDB
April 25th, 2005



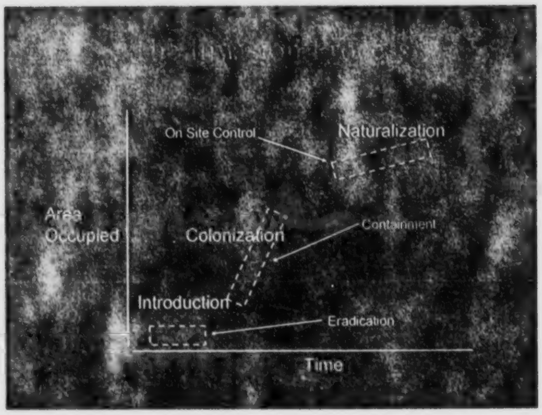
SARM Resolutions

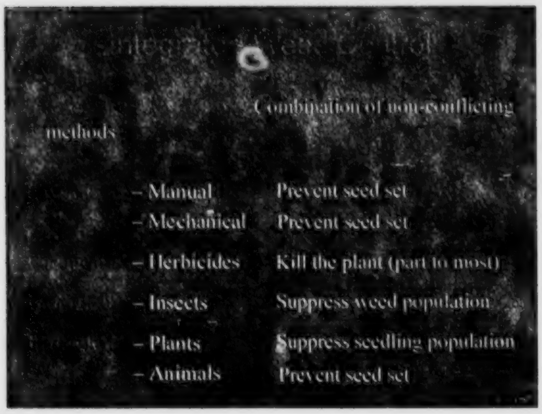
1974, 1975, 1978, 1982, 1986, 1989: Tarpaulin
1978, 1981, 1985, 1988, 1999: Field Bindweed
1978, 1986, 1996: Scentless Chamomile*
1981, 1982, 1985: Fines, $ Expenditures Limits
1982: Railway ROW
1987: Baby's Breath
1988: Leafy Spurge*
1992, 1994: Downy Brome*
1993: Common Tansy
1998: Japanese Brome*
1999: Weed Inspector Training
1999, 2002: Weed Seeds
*Noxious Weed

[illegible] Identification & Danger
[illegible] Biology & Ecology
[illegible] Integrated Weed Control

[illegible] Quarantine at far away locations
[illegible] Reduce to a population of zero
[illegible] Contain a population within a specific area

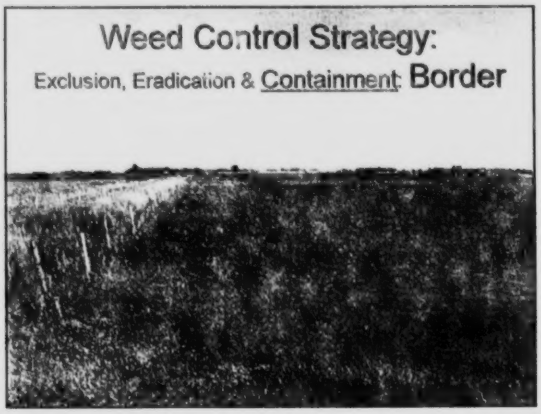
[illegible] for weeds (GPS)
[illegible] weeds (Integrated Weed Control)
[illegible] for success





[illegible] Combination of non-conflicting methods

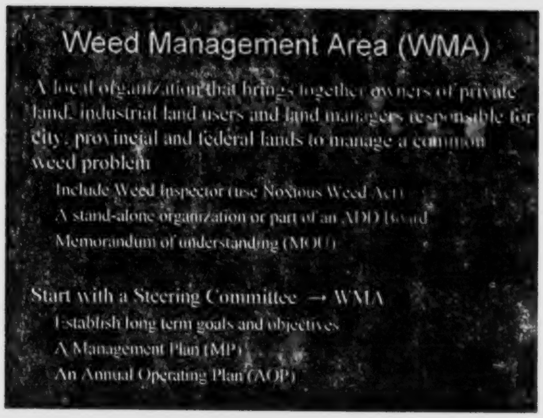
– Manual	Prevent seed set
– Mechanical	Prevent seed set
– Herbicides	Kill the plant (part to most)
– Insects	Suppress weed population
– Plants	Suppress seedling population
– Animals	Prevent seed set



Weed Control Strategy:
Exclusion, Eradication & Containment: **Border**

Awareness

Scentless Chamomile
SCENTLESS CHAMOMILE



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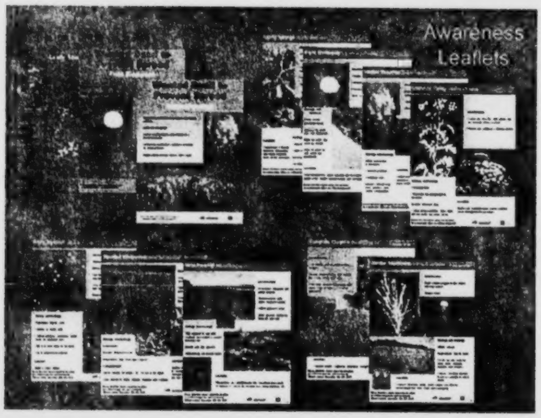
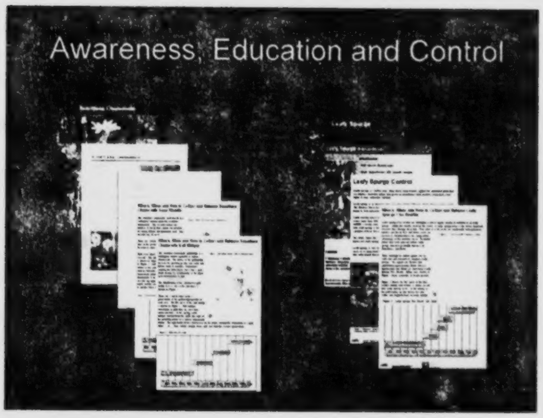
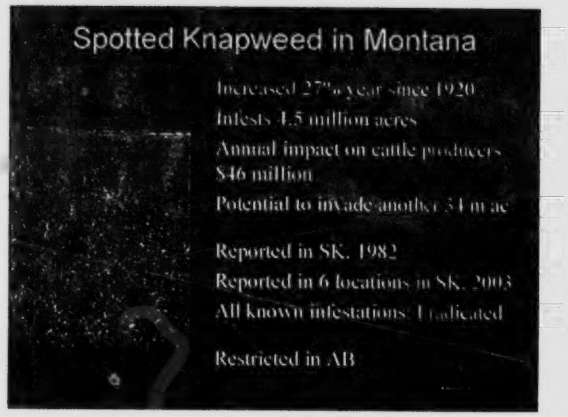


Awareness Leaflets



Awareness, Education and Control



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- Annual impact on cattle producers $46 million
- Potential to invade another 34 m ac

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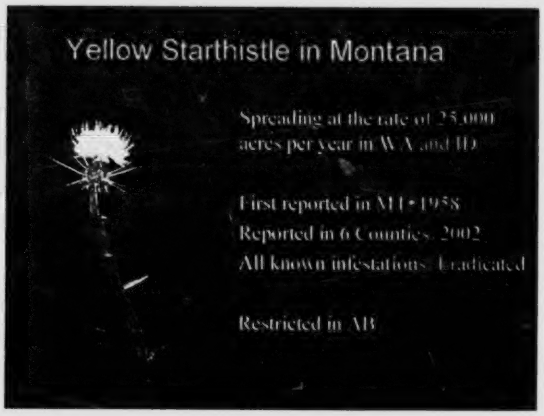
- Reported in 6 locations in SK, 2003
- All known infestations Eradicated

- Restricted in AB



Yellow Starthistle in Montana

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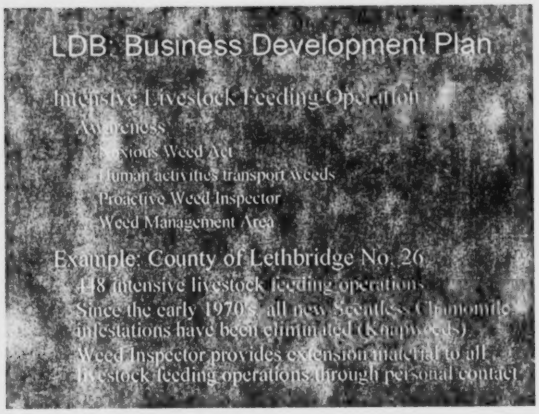
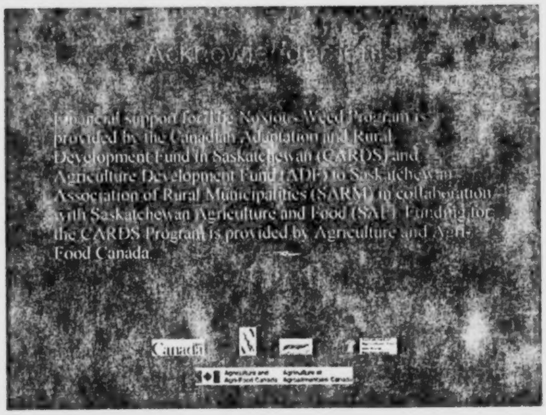


LDB: Business Development Plan

- Intensive Livestock Feeding Operation
  - Awareness
    - Noxious Weed Act
    - Human activities transport weeds
    - Proactive Weed Inspector
    - Weed Management Area
- Example: County of Lethbridge No. 26
  - 418 intensive livestock feeding operations
  - Since the early 1970's, all new Scentless Chamomile infestations have been eliminated (Knapweeds)
  - Weed Inspector provides extension material to all livestock feeding operations through personal contact



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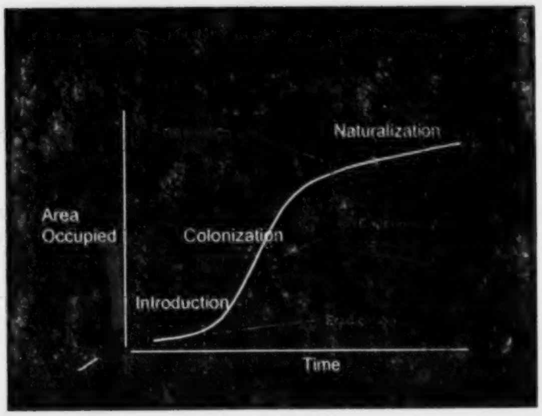
Canada

Agriculture and Agri-Food Canada Agriculture et Agroalimentaire Canada

Garry Bowes

Coordinator
Noxious Weed Program

- The Proactive Weed Inspector
- Stop the Spread of Leafy Spurge
- Leafy Spurge Flea Beetle Collection and Distribution
- 2005 Weed Inspector Appointments
- Handouts



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2006 Saskatchewan U-Pick Leafy Spurge Flea Beetle Information Guide

Biological Control Agent Profile for Spurge Flea Beetles Page 3

    Description of the Brown Dot Spurge Flea Beetle Page 3

    Description of the Black Dot Spurge Flea Beetle Page 4

    Description of the Black Spurge Flea Beetle Page 6

How to Collect Spurge Flea Beetles for Release Page 7

Establishing a Release Site Page 11

Assessment of Beetle Establishment Page 13

Beetle (*Aphthona* spp.) Release Form Page 16

Spurge Flea Beetle Monitoring Report Page 18

List of Sites for Collecting Spurge Flea Beetles Page 19

Canada

SARM

CARDS

Saskatchewan
Agriculture
and Food

Dear Colleague

This report contains recent information on sites where biological control agents are established. Also, included is the method for collecting the agents.

The text for the method of collection is modified and reformatted from a previous publication, the Integrated Biocontrol Strategies for Noxious Weeds, Field Reference Manual by Brad Thompson. Photographs are not included in this report. Also, added was information from the web site of the Lethbridge Research Centre (http//res2.agr.ca/lethbridge).

The list of sites for beetle collection includes a contact person and a telephone number. **Please telephone the contact person for permission to collect biological control agents and the landowner for the right-to-enter private land.**

Please, do not trespass!

In the spring of 1999, the author attempted to telephone each contact person to find out if the release site is present and if there is any evidence of insect activity on leafy spurge. Since 1999, many of these sites have been monitored. This report contains the most up to date information on a release site.

Sites were assessed during July and August, on days that may not have yielded the highest number of beetles per sweep. Generally, the highest number of beetles per sweep are found on hot days (>30°) when the wind velocity is low. This is the best time for collection, which varies from year to year, starting during the last week of June into July in southern Saskatchewan. You will need to monitor a site frequently to find the best collection date.

If you have any comments on this report, please forward them to the author.

Best wishes,

Garry Bowes
Coordinator, Noxious Weed Program*
3830 Thatcher Avenue, Saskatoon, SK, S7K 3H6

Telephone: 933-7695
Facsimile: 933-7352
e-mail: gbowes@agr.gov.sk.ca

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Biological Control Agents*

Biological control of leafy spurge is primarily by flea beetles which feed on the roots and leaves of the weed. The following insect profiles provide details on these insects, which show promise and/or have exhibited success in the control of leafy spurge in Saskatchewan.

Biological Control Agent Profile for Spurge Flea Beetles (*Aphthona* spp)

Description of the Brown Dot Spurge Flea Beetle (*A. cyparissiae*)

The adult flea beetle is approximately 2 - 3 mm long, dark brown in colour with an oval shape. Adults emerge in late June to early July to feed on the foliage of the leafy spurge plant. When the temperature is <10°C, adult movement is slow. The adults feed on the margins of the upper leaves and will actively jump or fly on warm sunny days. During this period, adults mate and the females will deposit eggs in the soil near the roots of the leafy spurge plant. Over the course of the summer, each female will lay an average of 285 eggs. The eggs hatch in approximately 17 days, and the larvae burrow through the soil in search of a first year root to feed on. As the larvae develop, they feed on the larger perennial roots. Larvae development requires about 165 degree-days above 10°C, which is about a 75-day feeding period. Root feeding stresses the leafy spurge plant because the larvae damaged the root system by consuming plant reserves. Feeding by the larvae continues throughout the summer and into early fall at which time the larvae construct an over wintering cell. Larvae must have at least 4 months at

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- This text is modified from the Integrated Biocontrol Strategies for Noxious Weeds, Field Reference Manual by Brad Thompson, available from Saskatchewan Agriculture and Food. Photographs are not included.

<10°C to complete development. By mid-August the majority of the adult beetles have died. Feeding by larvae resumes in the spring for about 3 weeks after which the larvae pupate for 28 - 57 days. New adults emerge in late June and early July. There is one generation per year.

Impact of the Brown Dot Spurge Flea Beetle (*A. cyparissiae*)

The brown dot flea beetle can reduce the canopy cover of leafy spurge to <10% in a warm mesic sandy loam site. From the release point, the beetles attack in an expanding circle. Flowering leafy spurge plants are replaced by many small non-flowering stems, which are replaced by grasses and forbs.

Preferred Habitat for the Brown Dot Spurge Flea Beetle (*A. cyparissiae*)

The preferred habitat for the brown dot spurge flea beetle is:

- Flowering leafy spurge with an average height of **65 cm**
- Less than **80 flowering stems/m^2**
- A site with < 10% brush cover of the soil surface and < 25 cm tall
- The presence of green needle grass, *Stipa virdula*, growing with leafy spurge
- **Sandy to sandy loam soils** with ~60% sand and 15 - 25% clay
- Moist sites in the short grass prairie and in the aspen parkland

Description of the Black Dot Spurge Flea Beetle (*A. nigriscutis*)

Similar to the brown dot spurge flea beetle, the adult black dot is 2 - 3 mm long and oval shaped. It also is predominantly bronze coloured but with a tiny distinguishing black dot located immediately behind the head. The life cycle of the black dot flea beetle mirrors the life cycle of the brown dot with emergence in late June and early July.

One difference between the two species is the oviposition (egg-laying) period, which is shorter for the black dot flea beetle. Although this egg-laying period ends earlier, the total number of eggs laid is the same.

The habitat preference of the black dot flea beetle is the main difference between it and the brown dot spurge flea beetle. The black dot flea beetles prefer hot, open sites, which are drier than the areas preferred by the brown dot flea beetle.

Impact of the Black Dot Spurge Flea Beetle (*A. nigriscutis*)

The black dot spurge flea beetle can reduce the canopy cover of leafy spurge to <10% of the soil surface in warm open sites on dry coarse soils.

Preferred Habitat for the Black Dot Spurge Flea Beetle (*A. nigriscutis*)

Habitat characteristics that are most favourable for the black dot spurge flea beetle are:

- Leafy spurge flowering height of **60 cm or** less
- Less than 55 **flowering stems/m^2**
- A leafy spurge cover of 35% to 75% of the soil surface
- The cover of shrub and herb species should be **less than 5%** of the soil surface
- Preferred release sites are located in the warm, dry portion of the short grass prairie, the mixed grass prairie and aspen parkland
- The predominant grass species in uncultivated sites is spear grass, *Stipa comata*
- Locate release sites on **south-facing slopes, ridges, or knolls**

Description of the Black Spurge Flea Beetle (*A. lacertosa)*

There are two black flea beetles, *A. lacertosa* and *A. czwalinai*. *A. czwalinai* is more tapered at the front than the rear, whereas *A. lacertosa* is equally tapered.

As the name implies these beetles are black in colour and are 3 mm in length. Apart from this difference, their life cycle is similar to the other two species of beetle. However, there are differences in the development time and conditions during the life cycle. The eggs hatch in 17 days at 21°C. Larvae development requires 127 degree-days above 14°C or a minimum of 88 days at a constant 21°C. In the chamber, larvae hibernate for at least 4 months at <10°C. The black spurge flea beetles prefer environments that are moister than the habitats of other two species. The black spurge flea beetles also favours loam to clay-loam soil conditions.

Preferred Habitat of the Black Spurge Flea Beetles

- Unshaded and well watered loam and clay soils
- Will tolerate flooding for up to 3 months
- Will not survive on marshy sites

Matching *Aphthona* Beetles to the Leafy Spurge Infestation

Most sites will not exhibit all of the listed characteristics for any one species of spurge flea beetles, but those sites that more closely match the outlined habitat requirements will perform better.

> *The parameter, which is most important, is ground cover or the amount of light reaching the soil (leafy spurge height, leafy spurge density, and brush cover).*

Since the beetle larvae exert the greatest stress on leafy spurge roots, it is important for the sun to warm up the soil to stimulate the larvae to feed actively. This limitation renders the beetles ineffective in controlling leafy spurge when the brush cover exceeds *25%* or if leafy spurge density is too high. Additionally, sandy soil allows the larvae to move easily through the soil to access more roots.

How to Collect Spurge Flea Beetles for Release

Site Selection

Site assessment is the first step in the collection process. Potential release sites must be evaluated before beetle collection to ensure the proper species of beetles are collected. Select a site that is most similar to the preferred habitat for the brown dot, black dot or black spurge flea beetle. Release the most appropriate species for a site. Releasing a mixture of all three species, with the species in the highest percentage matching the release site, allows each species to thrive in micro sites.

Prepare for Collection

Many successful flea beetle sites are established throughout Saskatchewan. Table 1 lists locations where viable populations were monitored in 1994 – 1995 and 1999 - 2005. Between 1999 and 2005 new releases were made in Saskatchewan. Releases made in 2005 and monitoring data collected during 2005 are recorded in the 2006 report. Before collecting, one should call the appropriate contact person listed in Table 1 to ensure there is a viable population at a selected collection site. In addition, the contact person may be able to provide advice on the number of collections that can be made at the site. Call the landowner and request permission to access private property. According to research in the United States, spurge flea beetles cannot be over-collected from an established site. Most of these sites are on private property so **permission from the landowner to enter private must be obtained**.

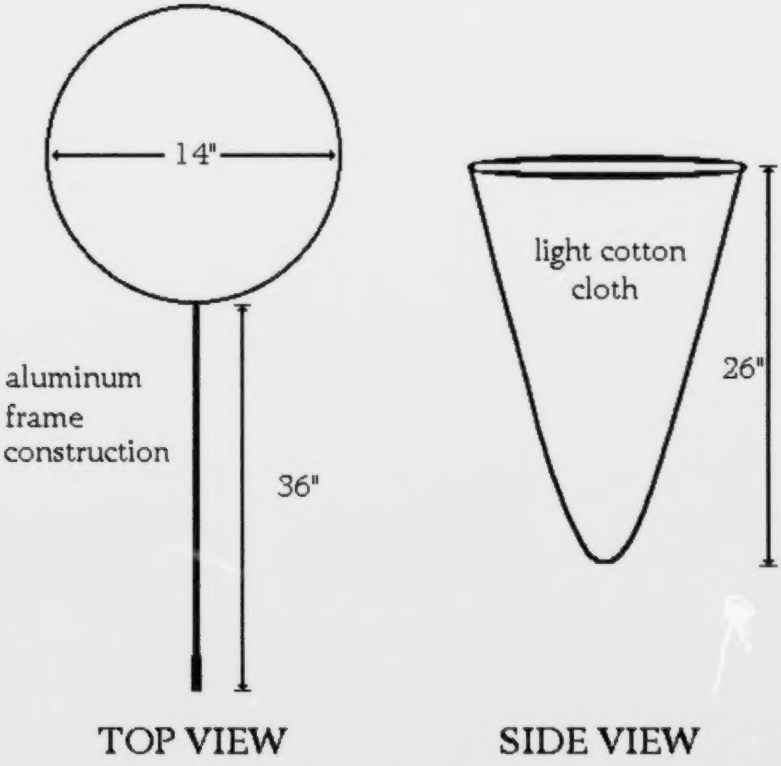
Collection Equipment

The equipment needed to collect the spurge flea beetle is as follows:

- Sweep net
- Collection containers

- Stapler
- Cooler with ice packs

Use a sweep net to capture spurge flea beetles. You will need to construct or purchase a sweep net. Figure 1 shows specifications for sweep nets used by Saskatchewan Agriculture and Food.


14"
aluminum frame construction
36"
TOP VIEW
light cotton cloth
26"
SIDE VIEW

• Figure 1 Standard specifications for a sweep net

If you choose to buy a sweep net, the fabricator that Saskatchewan Agriculture and Food has used in the past is: PRO METAL INDUSTRIES LTD., 455 Henderson Drive, Regina, SK, S4N 5W8, phone 306-525-6710. The approximate cost for a unit is $40. Agriculture and Agri-Food Canada at Saskatoon use a sweep net purchased from: Ward's of Canada Ltd., 397 Vansickle Road, St. Catharines, ON, L2S 3T5, phone 1-800-387-7822. The net used is called: Ward's Heavy-Duty Beating Net, catalogue number 10 V 0560, costing $53.75 plus taxes. When ordering replacement bags use: Replacement Bags, catalogue number 10 V 0565, costing $20.15 plus taxes. Another choice for a sweep net is: BioQuip Products, Inc., 2321 Gladwick Street, Rancho Dominguez, CA 90220, phone: 310-667-8800, fax: 310-667-8808 and e-mail: info@bioquip.com. Prices in BioEquip's catalogue are in US dollars.

Time of Year to Collect Spurge Flea Beetles

The timing of collection is important in order to maximize the number of beetles collected. High beetle numbers feeding on leafy spurge often occur during hot days (>30°C) with light winds. Collections are most productive in late June and early July as soon as the adults have emerged. Adults are active but have not laid many eggs. It is best to collect beetles at this time in order to maximize egg laying at the new site. This window of opportunity is approximately 3 weeks. Collections after this time may fail, as an insufficient number of eggs will be laid to create a viable population for the following year.

There is no guarantee that sufficient numbers still exist to support a collection at the sites listed in Table 1. It is recommended that before collections are attempted, one should phone the listed contact person in the area to ensure that there is a viable beetle population.

Weather at the Time of Spurge Flea Beetle Collection

Weather conditions are important for a successful beetle collection. The ideal day is a sunny hot day (>30°C) with little wind. These conditions are conducive to the adults feeding on the upper canopy of the leafy spurge infestation. When the weather is cool, wet, and/or windy, the beetles are not very active and tend to stay closer to ground.

Method for Collecting Spurge Flea Beetles

To start a collection, move directly to the release point at the collection site; ideally, a stake should be present to mark the release point. If a stake is not present, there should be sufficient beetle damage to determine the area where the beetles were released. Leafy spurge density will be low and will gradually increase with distance away from the release site, creating a "halo-effect" around the point of release. At well-established sites, beetle spread will be extensive and this gradation may not be quite as apparent.

To begin collections take one or two sweeps of the leafy spurge plants around the initial release site and count the number of beetles caught. This provides an estimation of the number of beetles captured per sweep in the area. When sweeping, sweep only the top 6-8 inches of the plant to collect the beetles. The motion of the net should be a quick sweeping motion, side to side in the direction of movement. Try to be quick with the net, but without shearing the plant tops.

Once the average number of beetles per sweep has been determined, collection of the beetles for the releases can begin. Try to collect at least 1000, 2000 preferred, to start a new colony. Dr. Rob Boucher, AAFC in Lethbridge, AB releases 2000 on good sites and 4000 on poor sites. In the United States, TEAM Leafy Spurge liked to release 6000 per site. The number of releases that are collected depends on the number of proposed release sites and the number of beetles present at the collection site. More than one release can be made in a large leafy spurge infestation. However, if there are many proposed releases it is better to make one release in each site to ensure a population establishes in one area of a site to allow for subsequent re-distribution. Experience has also shown that sweeping in areas that are not heavily infested with leafy spurge plants can yield a high number of beetles. If a stand is difficult to walk through or sweep in, it probably does not contain many beetles.

> *Try to avoid extraneous movement in the collection area because when disturbed the beetles will jump off the plants and fall to the ground.*

When the beetles are in the net, the next step is to transfer them into one of the collection containers. First, remove some but not all of the vegetation from inside the sweep net. Leaving a little leafy spurge material with the beetles is a good idea if they are going to be stored. Next, gently shake the net so all the beetles fall to the bottom. The beetles will try to crawl and hop out so do not leave the net unattended for too long. When the beetles are at the bottom of the net, pinch it off into a pocket so they cannot climb out. Gently empty this little pocket of beetles into the collection container (either a milk carton or paper bag), and when all the beetles are out of the net, seal the container using a stapler. **Make sure the container is thoroughly sealed,** or more beetles may be crawling on the outside than the inside of a container! Once the beetles are safely sealed away, put them in a cooler. If the beetle release is almost immediate after collection and the vehicle they are being transported in is air-conditioned, they should survive transport. Repeat this process to obtain the number of releases desired.

Establishing a Release Site

Selecting the Release Point

Select the exact location for a release several weeks before collection day. Because there are only a few hot, low wind days in Saskatchewan, you will want to spend most of your time collecting beetles during ideal weather conditions.

There are a few conditions to bear in mind when selecting a release site. The leafy spurge density should be within the appropriate parameters listed in the habitat preference section. A common misconception has been to put the beetles in where the leafy spurge is thickest. Unfortunately, when the females lay their eggs, the canopy will shade the ground inhibiting the development of the beetle larvae.

> *Choose a spot where the leafy spurge is somewhat thinner, usually near the perimeter of the stand.*

This will allow the beetles to spread naturally into the thicker leafy spurge with greater success. In terms of geography**, a good release site is one with a south-facing slope**. Since the larvae are root feeders, it is important for the soil to warm up in order that the larvae become active and feed on the roots. Moreover, slopes are good release sites because they are also well drained; a release site should not be located in a depression because standing water can drown the larvae.

As mentioned in the Introduction, predators also pose a threat to a new beetle release. Insects such as ants and wasps will feed on the beetles. **Do not release the beetles near an ant hill or wasp nest.** Placing a release close to an ant hill or wasp nest will only serve to provide those insects with a temporary change in diet.

Equipment Needed

If the proposed sites have sufficiently met the criteria for the species of beetles being released, mark the sites for future beetle release. The following equipment is recommended for marking sites:

- Stake (4-6 feet in length)
- Sledge hammer
- Camera

- Pen and paper
- ¼ m^2 quadrat
- Use a GPS (Global Positioning System) which is a satellite-based navigation system to record the position (latitude and longitude) of the site

How to Release Spurge Flea Beetles

After the preliminary work is done, release the beetles. Begin by opening the transport container. Lay it on the ground on its side close the release point. The container does not have to be exactly where the stake is, within 1 meter is acceptable.

> *With the container open, the beetles can move out of the container on their own and acclimate themselves to the new environment.*

This is particularly important if the beetles have been stored at cool temperatures for any length of time. Simply dumping them out of the container creates an additional stress, which will increase mortality. During the 10 - 15 minutes that the beetles need to "warm up" it is advisable to complete a release data sheet. After 10 - 15 minutes, pickup the container and gently shake out the remaining beetles. Put all of the beetles in one spot. When all the beetles are out, take a photograph of the site. Pictures should include the stake and give a clear visual picture of the leafy spurge infestation.

A copy of the release form used by Saskatchewan Agriculture and Food is included with this document. If you need additional copies of the release form, then print or photocopy the form in this report. The requested information allows for the site characteristics to be compiled and used to properly evaluate the success of the biological control agents. Most of the information requirements are self-explanatory; however a brief discussion of a few points will serve too high light their importance. The approximate age of the leafy spurge stand is significant when trying to correlate the time required for the beetle to provide adequate control of the weed. Older leafy spurge stands have a more extensive the root system. Consequently, shoot reduction by any of the spurge flea beetles in a stand that is 20 years old will take much longer than a stand that is 5 years old. Larvae eat small roots that were the recently produced by the weed.

Information pertaining to the density and height of the flowering and non-flowering shoots is required to establish a baseline reference point when the beetles are released. Early signs of beetle damage include an increase in the number of non-flowering stems and a reduction in the number of flowering stems.

The easiest way to determine the number of stems in a square meter is to fabricate a small quadrat, 0.5 x 0.5 meters in size. You can use rebar or wood to construct a quadrat. Randomly place a quadrat in a leafy spurge stand and then count leafy spurge stems within the quadrat. This provides the number of stems per quarter square meter, so multiplying this quantity by 4 will determine the number of stems per square meter.

Record percent cover, site topography, and weather conditions for the site. These are characteristics, which affect the probability of a successful release. Information on topography may indicate the prevalence of standing water at the site.

Temperature at the time of release may help explain why a site failed, when all the site requirements appeared optimal. For example, on a cool day, recently released beetles will not be active and are not fully camouflaged by the ground cover. This can lead to higher predation from other insects to the point that establishment could not occur.

Although some of these cause-and-effect relationships may not seem intuitively obvious, possessing a complete set of data will allow proper evaluation and provide possible explanations for the success or failure of beetle establishment.

Assessment of Beetle Establishment: Annual Site Evaluation

Monitoring a Spurge Flea Beetle Release Site

Beetle release sites should be monitored on a regular basis in order to assess the relative health of beetle populations. The optimal time for monitoring the success of beetle establishment is the last week of June to the third week of July. Weather should be warm and sunny, to ensure beetles are active on the upper portion of the plants.

Monitoring Equipment

The equipment needed to perform the yearly follow-up includes:

- Sweep net
- Pen and data sheet
- Camera
- Hammer and stake
- $^1/_4$ m^2 quadrat
- A GPS receiver

As mentioned previously, the hammer and stake are optional but very handy for replacing the original stake if it has been broken or vandalized. The best method for locating a site is marking its position (latitude and longitude) and finding it with a GPS receiver.

Method to Monitor Spurge Flea Beetle Establishment

To begin the annual assessment, move directly towards the release stake with the equipment. Observe the plants on the way to the site to see if beetles are actively feeding on the foliage or if the shoots exhibit any beetle damage. Within two metres of the release stake, make one or two sweeps of the leafy spurge plants. Check for the presence of beetles in the net and determine the number collected. Empty the net in the location you have swept and repeat the procedure at different locations around the stake. When a consistent number of beetles are obtained on each sweep, begin to move away from the stake to determine the radius of spread. Although this spread is commonly circular, the beetles may move in one direction to an area of leafy spurge that is more favourable. Once the number of beetles per sweep adjacent to the release stake and the distance of spread are recorded on the data sheet, then record the density and height of flowering leafy spurge shoots inside and outside the beetle feeding area. Finally record any comments that may be pertinent to the beetle population (spring snow, insecticide drift) or leafy spurge stand (herbicide drift, mowing). In the event the data obtained that year are not consistent with data collected in previous seasons; comparable pictures of a site on a yearly basis are an excellent way to track and record progress at a site. To maximize the effectiveness of the photographs, always photograph from the same location, with the same perspective as the previous years' photographs. Use the data sheet provided as an outline of the type of information that is important to collect. The data collected is very similar to that recorded at the release except measurements are recorded inside and outside the established beetle area.

Evidence of Spurge Flea Beetle Damage on Leafy Spurge

Signs of beetle damage are "shot-holes" in the leafy spurge leaves from adult feeding and a reduction in the number of flowering stems. An increase in the proportion of new nonflowering leafy spurge shoots to flowering shoot is typical of flea beetle larvae damage in the first few years after release. As beetle establishment continues, the beetles will then reduce the number of non-flowering shoots. This will create a halo around the release point where few or no leafy spurge shoots remain.

A greater proportion of non-flowering shoots is a direct consequence of larval damage to the root system. The plant develops more shoots to offset the loss of buds and root reserves in the plant. Therefore, the increase in non-flowering shoots around the release site indicates the presence of larval damage. This effect may persist for up to four years. Other signs the beetle has successfully established in an area are:

- capturing *25* beetles or more with 5 sweeps the year subsequent to release;
- the presence of beetles 5 meters away from the initial release point one year after release;
- an increase in the number of non-flowering leafy spurge stems (which may persist up to four years) surrounding the release stake; and
- a reduction in the number of flowering stems after two or three years.

When to Harvest a Release Site for Redistribution

Beetle releases that exhibit excellent establishment are generally ready for harvest three full years after the initial release. Harvest sites when a sweep averages 6 to 15 or more beetles in the net. If the average is at or above this number, then the site can comfortably support beetle collection; below this, harvest is risky. Other factors to consider when deciding whether or not harvesting is appropriate include: weather conditions at the time of monitoring; age of the release; spread of the release; and knowledge of previous collections on the site.

Spurge Flea Beetle (*Aphthona* spp.) Release Form

Date: ____________________ Agent released: ____________________

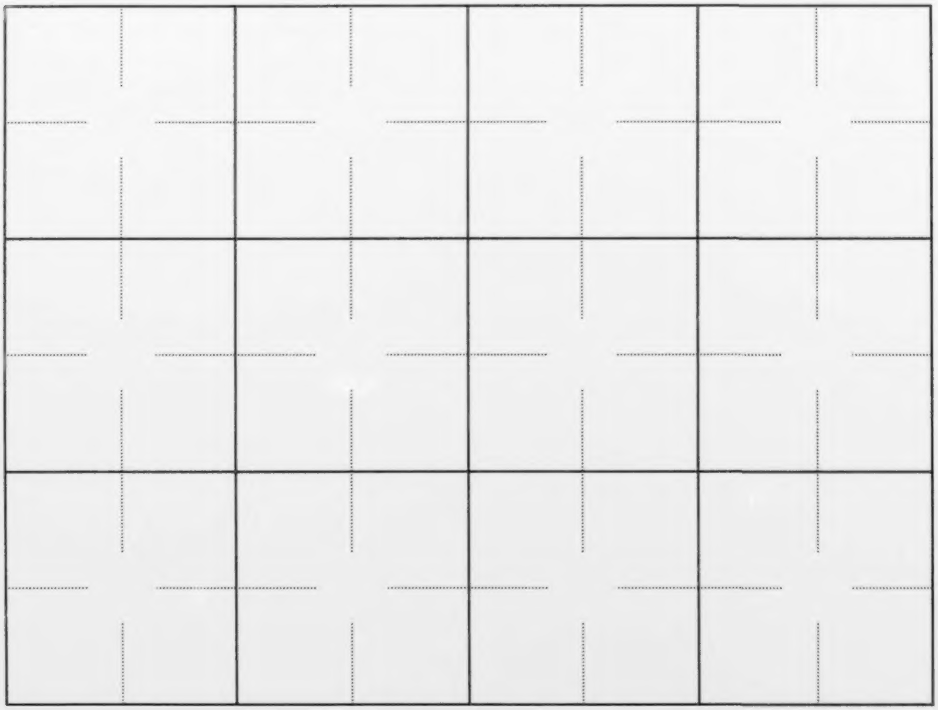
Number of beetles released: __________ Release code: ____________________

Release location: ____________________ Nearest town: ____________________

Directions to release site (including legal location): ____________________

Enter Section in one of the squares below Range ____

Tp ____



Released by:

Name: ____________________

Address: ____________________

City: ____________________

Province: ____________________

Postal code: ____________________

Phone: ____________________

Landowner (if different from release person)

Name: ____________________

Address: ____________________

City: ____________________

Province: ____________________

Postal code: ____________________

Phone: ____________________

(Please proceed to the next page)

Site Characteristics

Infestation: _______ Continuous _______ Patchy

Extent: _______ <2.5 ha (<6 acres) _______ 2.5 – 10 ha (6 – 25 acres) _______ >10 ha (>25 acres)

Approximate age of spurge stand: ____________

Stems per square meter: ___________ % of stems flowering: ___________

Average height of flowering stems: ___________ Non-flowering stems: ___________

% Cover (all vegetation except spurge): ___________

Site topography: _____ Level _____ Slight slope _____Steep slope

Temperature (day of release): ______ °C

Weather conditions (day of release): ________________________________
(Sunny, windy, etc.)

Land Use

Current use: ______ pasture ______ right-of-way ______ parkland

______ other, if so describe: ______________________________

ANY herbicides applied within 2 yr.? ______ Yes ______ No

If yes, type and rate: ______________________________

ANY herbicides applied within 2 yr.? ______ Yes ______ No

If yes, type and rate: ______________________________

Miscellaneous Information: (comments concerning adverse weather or agronomic conditions that could influence either insect numbers (i.e. pesticide drift) or weed stands)

PLEASE REMEMBER TO STAKE THE SITE

Please make a copy of this release form and forward it to:

Garry Bowes, 3830 Thatcher Avenue, Saskatoon, SK S7K 2H6
Phone: 933-7695, Fax: 933-7352, e-mail: gbowes@agr.gov.sk.ca

Spurge Flea Beetle (*Apthona* spp.) Monitoring Report

Site Data

Release Number: ____________________ Agent: ____________________________

Assessment person: ________________ Date: ______________________________

Contact phone number: _____________ Legal location: _____________________

Sample Data

Time: __________________ Temperature: _______________________

Weather conditions at time of sampling: ____

____

Inside Beetle Area

Number of flowering plants /m^2: ________

Height of flowering plants: ________

% Cover

- Leafy spurge: ________
- Grasses & Forbs: ________
- Bare ground: ________

Outside Beetle Area

Number of flowering plants /m^2: ________

Height of flowering plants: ________

% Cover

- Leafy spurge: ________
- Grasses & Forbs: ________
- Bare ground: ________

Insect Density Estimate

Number of beetles per sweep: ________________

Maximum distance of spread: ________________

Feeding damage observed: ________________

Herbicide Use

Any herbicide applied within the last year? ______ Yes ______ No

If yes, please indicate the 1) type 2) rate 3) timing: ____________________________________

____

Miscellaneous Information

(Comments concerning adverse weather or agronomic conditions that could influence either insect number (i.e. pesticide drift) or the weed stand)

____

____

Please make a copy of this release form and forward it to:

Garry Bowes, 3830 Thatcher Avenue, Saskatoon, SK S7K 2H6
Phone: 933-7695, Fax: 933-7352, e-mail: gbowes@agr.gov.sk.ca

Table 1. List of Sites for Collecting Spurge Flea Beetles

RM 1 Argyle SW 7-2-31 W1 SK-N-90-0045	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in1995	**3 to 4**	10 x 20	60	55	85.6	5.2	
Monitored in 2000	**0**						

Black Dot Beetle Release in 1990. N 49.10379 W 101.62551

Comments: In 1997, lots of beetles on site. Sunny, warm and light wind when monitored in 2000. Site is not grazed and has a thick litter layer. Site died out. GPS1 WP28.

Contact Person: Val Olney 685-2010

RM 1 Argyle SW 7-2-31 W1 RM Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1993	**2**	9 x 5	80	40			40
Monitored in 2000	**1**						

Brown Dot Beetle Release in 1992 from Maxim. N 49.10379 W 101.62551

Comments: In 1997, lots of beetles on site. Sunny, warm and light wind when monitored in 2000. Lots of beetles in 1999 Site has not been grazed for years and has a thick litter layer. GPS1 WP28.

Contact Person: Val Olney 685-2010

RM 2 Mount Pleasant SW 3-3-32 W1 SK-C-90-0002	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**7 to 10**	10 x 30	75	55	74.6	7.7	
Monitored in 2000	**5 to 8**						

Brown Dot Beetle Release in 1990. N 49.18410 W 101.72844

Comments: 1999: Phone survey. In 1997 lots of beetles, leafy spurge is reduced. Sunny with some clouds when monitored in 2000. In 1999, lots of beetles. Beetles found in areas with little litter on a south facing slope. Some leafy spurge thinning. Site has not been grazed for several years. GPS1 WP024.

Contact Person: Brian Miller 482-3313

RM 2 Mount Pleasant SW 3-3-32 W1 Farmer Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1993	**3**	10	48	35			10
Monitored in 2000	**0 - 1**						

Brown Dot Beetle Release From Maxim in 1992. N 49.18410 W 101.72844

Comments: In 1997 lots of beetles, leafy spurge is reduced. Sunny with some cloud when monitored in 2000. The site is north of a ridge into a valley and has lots of litter. No evidence of leafy spurge damage. GPS1 WP024.

Contact Person: Brian Miller 482-3313

RM 4 Coalfields NE 5-2-4 W2 SN-96-003	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in							

Brown Dot released in 1996. N 49.0983 W 102.4954

Comments: Nearest City: North Portal.

Contact Person: Stephanie Schnell 634-7959; Landowner: Walter Lee 927-2235

RM 5 Estevan SW 14-1-7 W2 SK-C-92-0009	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**15**	30 x 50	45	35			
Monitored in 2000	**5 to 8**		2 to 5				
Monitored in 2002	**1 to 2**		0				

Brown Dot Beetle Release in 1992. N 49.03169 W 102.85227

Comments: 1995: Influence of beetles has spread out further this year continuing down the hill. Collections can be made in 1996. 1999: Phone survey. Good site in 1998, now a buffalo pasture (Lorne John). Sunny and hot when monitored in 2000. Higher numbers at the edge of the control circle. Good control down the hill. 2002: Release area. Photo 2002 P9 - 014, 015, 016. 15 - 20/sweep at the edge of leafy spurge (P9 - 15). GPS1 WP035.

Contact Person: Landowner Unknown

RM 5 Estevan NW 2-1-7 W2 SK-N-89-0009	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**10 to 15**	50 x 50	55	45	90.9	3.5	
Monitored in 2000	**1 to 2**	2 - 5 ac					
Monitored in 2002	**10**		>1				
Monitored in 2005	**10**	8 to 11	10	41			

Black and/or Brown Dot Beetle Release in 1989. N 49.00718 W 102.84924

Comments: 1995: Site has improved, beetles have increased & spurge density has decreased. Collections can be made in 1996. 1999: Phone survey. Very good site in 1998. When monitored in 2000, the beetles had spread over a large area. The leafy spurge stand was reduced/thinned. The edge of the spread of the beetles was not apparent. 2002: Release sites. Photo 2002 P9 - 012, 013. Mostly Black with some Black Dot. 2005: 50% Black, 50% Black Dot. 2005 P8 - 014. 50% Blacks. GPS1 WP032.

Contact Person: Don Seipp 634-4414, 421-0428 (cell)

RM 5 Estevan SE 3-1-7 W2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**5 to 10**	50 x 50	<1				
Monitored in 2002	**1**		<1				
Monitored in 2005	**0**		0	0			

Black Beetle Release in 1998. N 49.00697 W 102.84720

Comments: 2000: Sunny and hot when monitored. Beetles moved up the hill, 300 m. 2002: Release site, close up, area. Photo 2002 P9 - 009, 010, 011. 2005: No evidence of leafy spurge until top of hill. 2005 P8 - 015. Good control. GPS1 WP031.

Contact Person: Don Seipp 634-4414, 421-0428 (cell)

RM 5 Estevan SW 28-1-7 W2 Luscar1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**2**		5				
Monitored in 2005	**6 to 7**		6	56			

??? released on ??? N 49.05862 W 102.88057

Comments: 2002: Release area. Photo 2002 P9 - 005. Black Dot. Luscar Coal site. 2005: 100% Black Dot. 2005 P8 - 017. GPS1 WP218.

Contact Person: Allan Klesse 636-5256

RM 5 Estevan SW 28-1-7 W2 Luscar2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**3 to 5**		2				
Monitored in 2005	**2 to 3**		4				

??? released on ??? N 49.05886 W 102.87938

Comments: 2002: Release area and close up. Photo 2002 P9 - 006, 007. Black Dot. Luscar Coal site. 2005: Leafy spurge in an area with ants. 100% Black Dot. 2005 P8 - 016. GPS1 WP219.

Contact Person: Allan Klesse 636-5256

RM 5 Estevan SE 22-1 -8 W2 Seipp1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**30**		10				
Monitored in 2005	**13**		5	56			

Black Beetles released on July 2000. N 49.04809 W 102.99012

Comments: 2002: Release site. Photo 2002 P9 - 008. New site. 2005: Ants by release site; Photograph site closeup, area (road close sign). 100% Black. 2005 P8 - 018, 019, 020. GPS1 WP220.

Contact Person: Don Seipp 634-4414, 421-0428 (cell)

RM 5 Estevan NE 8-1-8 W2 Seipp2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**15 to 25**		10				

??? released on ??? N 49.02329 W 103.02457

Comments: 2002: Release site, area by water, area. Photo 2002 P9 - 017, 018, 019. In mid-October 2001, a wild fire burned the released area. 80% Black Dot and 20% Black. GPS1 WP222.

Contact Person: Don Seipp 634-4414, 421-0428 (cell)

RM 5 Estevan NE 8-1-8 W2 Seipp3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**25**		10				
Monitored in 2005	**30 to 40**		<1	84			

??? released on ??? N 49.02277 W 103.02462

Comments: 2002: Release area (2). Photo 2002 P9 - 020, 021. 25/sweep Black Dot and a few Black. 2005: Excellent suppression. 2005 P3 - 012. GPS1 WP221.

Contact Person: Don Seipp 634-4414, 421-0428 (cell)

RM 17 Val Marie NE 19-5-17 W3 White Ranch 1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2500 - 4000 Br Dot, Bl Dot and Bl released on July 14, 2005. N 49.40259 W 108.26956
Comments: 12 UTM 0698085 5475797. GPS2 WP580.
Contact Person: Released by Bob Springer 778-8301, Landowner Stacy Smith 297-2001.

RM 17 Val Marie NE 19-5-17 W3 White Ranch 2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2500 - 4000 Br Dot, Bl Dot and Bl released on July 14, 2005. N 49.40360 W 108.26965
Comments: 12 UTM 0698075 5475908. GPS2 WP581.
Contact Person: Released by Bob Springer 778-8301, Landowner Stacy Smith 297-2001.

RM 17 Val Marie NE 19-5-17 W3 White Ranch 3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2500 - 4000 Br Dot, Bl Dot and Bl released on July 14, 2005. N 49.40285 W 108.27055
Comments: 12 UTM 0698012 5475822. GPS2 WP582.
Contact Person: Released by Bob Springer 778-8301, Landowner Stacy Smith 297-2001.

RM 17 Val Marie NE 19-5-17 W3 White Ranch 4	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2500 - 4000 Br Dot, Bl Dot and Bl released on July 14, 2005. N 49.40281 W 108.27111
Comments: 12 UTM 0697972 5475817. GPS2 WP583.
Contact Person: Released by Bob Springer 778-8301, Landowner Stacy Smith 297-2001.

RM 17 Val Marie White Ranch 5	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2500 - 4000 Br Dot, Bl Dot and Bl released on July 14, 2005. GPS:
Comments:
Contact Person: Released by Bob Springer 778-8301, Landowner Stacy Smith 297-2001.

RM 17 Val Marie NE 24-5-18 W3 White Ranch 6	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2500 - 4000 Br Dot, Bl Dot and Bl released on July 14, 2005. N 49.49903 W 108.30603
Comments: 12 UTM 0695452 5475305. GPS2 WP584.
Contact Person: Released by Bob Springer 778-8301, Landowner Stacy Smith 297-2001.

RM 17 Val Marie NE 24-5-18 W3 White Ranch 7	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2500 - 4000 Br Dot, Bl Dot and Bl released on July 14, 2005. N 49.39864 W 108.30615
Comments: 12 UTM 0695447 5475262. GPS2 WP585.
Contact Person: Released by Bob Springer 778-8301, Landowner Stacy Smith 297-2001.

RM 36 Cymri NE 36-6-13 W2 SK-N-90-0048	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**15 to 20**	20 x 30	25	35	61.4	17.1	

Black Dot Beetle Release in 1990. N 49.5203 W 103.6202

Comments: 1995: Beetle numbers have recovered and they've moved down into the coulee. 1999: Phone survey. Good site in 1998, moved one-half mile.

Contact Person: Merlin Becker 456-2562

RM 38 Laurier NE 1-4-16 W2 Maxim	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**35**	unlimited	varies	varies			
Monitored in 1999	**5**		7	58			
Monitored in 2001	**5**		30				
Monitored in 2004	**7 to 30**		1	89			
Monitored in 2005	**30 - 40**		5	56			

Brown Dot Beetle Release in 1982. Also, black dot and black N 49.27943 W 104.03433

Comments: 1995: Approximately 11,000 beetles removed from site in 1995. 1999: Phone survey. In 1998 beetles were plentiful, beetles are reducing leafy spurge. 1999: Mixture of three species. 2001: Mostly Br Dot with some Black Beetles. The beetles thinned leafy spurge but some leafy spurge set seed. 2004: 95% Black, 5% Black Dot. 2004 P10 - 001 to P10 - 025. 2005: Excellent suppression. 100% Black. 2005 P3 - 012. GPS1 WP021.

Contact Person: Landowner Unknown

RM 42 Willow Bunch SE 23-6-28 W2 SN-96-001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in							

Black Dot released in 1996. N 49.4839 W 105.6609

Comments: Nearest City: Verwood.

Contact Person: M. Brown 473-2302; Landowner: 473-2777

RM 42 Willow Bunch SE 25-6-28 W2 SN-96-002	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in							

Black Dot released in 1996. N 49.4985 W 105.6385

Comments: Nearest City: Verwood.

Contact Person: M. Brown 473-2302, Landowner: Glenn Berner 642-5760

RM 43 Old Post NE 19-4-2 W3 Springer US5	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	3		10				

6,000 black beetles released on June 22, 2001. N 49.31820 W 106.24823

Comments: 2001: SE of Wood Mountain on 705, then south. Adjacent land was broke hayland in 2001. Site marked with metal T-posts. 2002: Release site. Photo 2002 P6 - 024, 025. Mostly Black Dot, some Black established. Found 10 hawk moths. Lots of ants at release site. GPS1 WP213.

Contact Person: Bob Springer 778-8301; Landowner: Judy Mergel 266-4211

RM 45 Mankota NW 9-3-8 W3 Meyronne11	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 1**						

Beetles released ??? N 49.20085 W 107.02545

Comments: 2004: 13 UTM 5451759 352455 GPS2 WP538

Contact Person: Dave Shortt 446-7463

RM 45 Mankota SE 28-7-7 W3 Syhlonyk1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Al Syhlonyk in mid-1980's to mid-1990's N 49.58672 W 106.89076

Comments: 13 UTM 5494399 363341 GPS2 WP539

Contact Person:

RM 45 Mankota SE 28-7-7 W3 Syhlonyk2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							
Beetles released by Al Syhlonyk in mid-1980's to mid-1990's				N 49.58221		W 106.88555	
Comments: 13 UTM 5493888 363705 GPS2 WP540							
Contact Person:							

RM 45 Mankota NW 21-7-7 W3 Syhlonyk3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							
Beetles released by Al Syhlonyk in mid-1980's to mid-1990's				N 49.57309		W 106.89284	
Comments: 13 UTM 5492888 363152 GPS2 WP541							
Contact Person:							

RM 45 Mankota NE 6-8-7 W2 Cortus1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							
Beetles released by Gary Cortus July 18, 2002				N 49.62345		W 106.92915	
Comments: 13 UTM 54968553 360671 GPS2 WP542							
Contact Person:							

RM 45 Mankota SW 5-8-7 W3 Cortus2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2005	**15 to 20**						
Beetles released by Gary Cortus July 18, 2002				N 49.61342		W 106.91618	
Comments: 13 UTM 5497413 361597 2005: Mostly Black Beetles. GPS2 WP543							
Contact Person:							

RM 45 Mankota NE 31-7-7 W3 Cortus3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2005	**15 to 20**						

Beetles released by Gary Cortus July 18, 2002 N 49.60481 W 106.92481

Comments: 13 UTM 5496480 360630 2005: Brown Beetles. GPS2 WP544

Contact Person:

RM 45 Mankota SW 28-7-7 W3 Cortus4	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Gary Cortus July 18, 2002 N 49.58198 W 106.90320

Comments: 13 UTM 5493895 362428 GPS2 WP545

Contact Person:

RM 45 Mankota SE 21-7-7 W3 Cortus5	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Gary Cortus July 18, 2002 N 49.57170 W 106.89038

Comments: 13 UTM 5492728 363326 GPS2 WP546

Contact Person:

RM 45 Mankota NE 21-7-7 W3 Cortus6	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Gary Cortus July 18, 2002 N 49.57807 W 106.88559

Comments: 13 UTM 5493428 363690 GPS2 WP547

Contact Person:

RM 45 Mankota SW 27-7-7 W3 Cortus7	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Gary Cortus July 18, 2002 N 49.58168 W 106.87215
Comments: 13 UTM 5493805 364672 GPS2 WP548
Contact Person:

RM 45 Mankota NE 22-7-7 W3 Cortus8	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Gary Cortus July 18, 2002 N 49.57584 W 106.86298
Comments: 13 UTM 5493139 365318 GPS2 WP549
Contact Person:

RM 45 Mankota NE 22-7-7 W3 Cortus9	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Gary Cortus July 18, 2002 N 49.57644 W 106.86255
Comments: 13 UTM 5493205 365351 GPS2 WP550
Contact Person:

RM 45 Mankota SW 22-7-7 W3 Cortus10	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Gary Cortus July 18, 2002 N 49.56758 W 106.87251
Comments: 13 UTM 5492238 364607 GPS2 WP551
Contact Person:

RM 45 Mankota SE 22-7-7 W3 Cortus11	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Beetles released by Gary Cortus July 18, 2002 N 49.56791 W 106.86693

Comments: 13 UTM 5492265 365011 GPS2 WP552

Contact Person:

RM 45 Mankota SE 15-6-7 W3 Stanger Rel 1997-98	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**0**						
Monitored in 2002	**<1**		10				
Monitored in 2003	**1 to 3**		6	69			
Monitored in 2004	**2**		2	51			
Monitored in 2005	**0**		0	0			

Black Dot or Brown Dot Beetles released in 1996-97. N 49.46556 W 106.85305

Comments: Nearest town; McCord. Cloudy, nearly raining when monitored in 2000. Plan to use 2,4-D at 24oz/ac + dicamba at 4 oz/ac, applied annually to control leafy spurge. Found 1 Black that had moved from the adjacent location. 2002: Release area (2), dam. Photo 2002 P10 - 001, 002, 003. Sampled patches on the east side. 2003: Black. Area treated with a herbicides, beetles are on the missed herbicide treated plants. Site photo. 2003 P10 - 001. 2004: Herbicides used. Isolated patches with beetles, Large patch has ants. 2004 P16 - 021, 022. 2005: 2005: 100% Black. Few leafy spurge plants, 2 had 6 black beetles each. GPS1 WP009.

Contact Person: Landowner: Calvin Govelin 478-2533

RM 45 Mankota NW 11-6-7 W3 Lennox Rel 1998	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**6 to 7**						
Monitored in 2003	**1**		1	25			
Monitored in 2004	**1**		3	25			
Monitored in 2005	**0**		0	0			

Black Beetle released in 1998. N 49.46531 W 106.85339

Comments: Nearest town; McCord. Cloudy, nearly raining when monitored in 2000. Plan to use 2,4-D @ 24oz/ac + dicamba at 4 oz/ac, applied annually to control leafy spurge. 2003: Site photo. 2003 P10 - 002. 2004: Isolated leafy spurge patches. 2004 P16 - 023. 2005: 100% Black. Few leafy spurge plants. GPS1 WP010.

Contact Person: Landowner: Calvin Govelin 478-2533

RM 45 Mankota NW 11-6-7 W3 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2003	**1**		1	25			
Monitored in 2004	**1**		10	36			
Monitored in 2005	**7 to 8**		8	30			

Released date unknown. N 49.46556 W 106.85305

Comments: 2003: Black. Site photos. 2003 P10 - 003, 004 (satellites around edge). 2004: Black. 2004 P16 - 025, 025. 2005: 100% Black. Photograph of area, site and closeup/Few leafy spurge plants, 2 with 6 black beetles each. 2005 P6 - 005, 006, 007. GPS1 WP011.

Contact Person:

RM 45 Mankota NW 1-1-8 W3 Sherven1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**2**		15				

??? released on ??? N 49.01201 W 106.95169

Comments: 2002: Release area (2). Photo 2002 P9 - 023. Black Dot. GPS2 WP349.

Contact Person: Mike Sherven 478-2323

RM 45 Mankota NW 1-1-8 W3 Sherven2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**2**		0				

??? released on ??? N 49.01024 W 106.95690

Comments: 2002: Release area, close up. Photo 2002 P9 - 024, 025. Sampled on the side of the hill, treated with Tordon 22K in 2001. On a warm day in the first week of July the site had up to 100/sweep. GPS2 WP350.

Contact Person: Mike Sherven 478-2323

RM 49 White Valley SW 36-7-22 W3 SK-N-88-0013	No. of Beetles / Sweep	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**5 to 8**		6	30			
Monitored in 2001	**2**						
Monitored in 2004	**9**		8	33			
Monitored in 2005	**1 to 3**		20	48			

1988 Black Dot Beetle Release, 1990-91 Brown Dot release. N 49.59934 W 108.86701

Comments: 2000: Sunny, with some cloud, cool, little wind when monitored. Beetles cover 5 - 8 ac. 2001: A lot of leafy spurge with vegetative shoots. 2004: Black Dot. 2004 P17 - 009, 010. 2005: 100% Black Dot. Site, closeup, area. 2005 P10 - 016, 017, 018. GPS1 WP150.

Contact Person: Louis Debbit 295-3553; Landowner: Peter Hanson 295-4078

RM 49 White Valley SW 36-7-22 W3 SK-N-90-0057	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**5 to 15**	unlimited	50	45	82.6	10.7	
Monitored in 2004	**3 to 4**		10	38			
Monitored in 2005	**1**		14	48			

Black Dot Beetle Released in 1990 N 49.6001 W 108.8627

Comments: 1995: Beetle success has improved in this area. Insect damage is beginning to show around the release point. Site not visited since 1995. 2001: Appears to be the same site as SK-N-88-0013. Site not found. 2004: Black Dot. 2004 P17 - 007, 008. 2005: Site, closeup, area. 100% Black Dot. 2005 P10 - 019, 020, 021. GPS1 WP019.

Contact Person: Peter Hanson 295-4078

RM 49 White Valley SW 36-7-22 W3 SK-N-90-0057	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**2**		10	56			

??? released on ??? N 49.59889 W 108.86863

Comments: 2004: Site on south west exposure, near top of hill. Black Dot. 2004 P17 - (011, 012, 013, 014 area), 015 (site), (016, 017, 018, 019, 020, 021, 022 large area with leafy spurge). GPS1 WPA17.

Contact Person: Peter Hanson 295-4078

RM 49 White Valley SW 36-7-22 W3 SK-C-91-0019	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**15 to 20**	unlimited	60	40	76.4	11.4	
Monitored in 2001	**5**		10	40			
Monitored in 2004	**4**		5	46			
Monitored in 2005	**1 to 2**		8	43			

Brown Dot Beetle Release in 1991. N 49.59889 W 108.86879

Comments: 1995: Site is doing well with high beetle numbers. Damage to the spurge is limited though due to the high density of the weed. Site may have merged with 1990 black dot site. Site not visited since 1995. 2001: Lots of plants with vegetative shoots and a few with seed heads. 2004: Black Dot. 2004 P17 - 006. 2005: 100% Black Dot. Site, closeup, area. 2005 P10 - 013, 014, 015. GPS1 WP151.

Contact Person: Louis Debbit 295-3553; Landowner: Peter Hanson 295-4078

RM 49 White Valley SE 5-8-22 W3 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**>1**						

Black Beetle released in 1998. N 49.6147 W 108.9418

Comments: Nearest town; Eastend. 2001: Site is located near bush, the beetle do not appear to be effective.

Contact Person: Landowner: Raymond White 295-4079

RM 49 White Valley SE 5-8-22 W3 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**>1**		10	40			
Brown Dot Beetle released in ?				N 49.61697		W 108.88155	
Comments: Nearest town; Eastend.2001: Leafy spurge is thinned out, some seed heads are present. GPS1 WP152.							
Contact Person: Landowner: Raymond White 295-4079							

RM 49 White Valley SE 5-8-22 W3 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**N=2 S=4**	N=40 S=30	N=30 S=30				
Brown Dot Beetle released in ?			North	N 49.62426		W 108.85671	
			South	N 49.62418		W 108.85711	
Comments: Nearest town; Eastend. Some leafy spurge thinning and some vegetative shoots. GPS1 WP153 and WP154.							
Contact Person: Landowner: Raymond White 295-4079							

RM 49 White Valley NW 10-5-19 W3 98 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**N=12 S=8**		N=10 S=20	N=41 S=38			
Black Beetle released in 1998.			North	N 49.37254		W 108.48488	
			South	N 49.37227		W 108.48632	
Comments: Nearest town; Shaunavon. Site is difficult to access. 2001: North; Leafy spurge is thinned out but some set seed. South; Some reduction in leafy spurge density. GPS1 WP148 and WP149.							
Contact Person: Trevor Lenox 297-5450; Landowner: Daryl Allemand 296-4712							

RM 63 Name SE 16-7-2 W2 McLean Rel 1998	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**1**	0	20				
Black Beetle released in 1998.				N 49.55669		W 102.21348	
Comments: Nearest town; Carlyle. Released at 2 locations, 2 posts, SE has ants and few black beetles, NW post, 1/sweep, near post with leafy spurge (few ants). GPS1 WP039.							
Contact Person: Landowner: Don Bax 453-6046							

RM 64 Brock NW 16-8-6 W2 SK-N-90-0046	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>20**	50 x 30	20	40	79.1	8.8	10

Black Dot Beetle Release in 1990. N 49.6511 W 102.7622

Comments: 1995: Site doing well. Some collections made. Relocated some beetles within site. Good site in the past. 1999: Phone survey. Lots of beetles in 1997, leafy spurge stand reduced.

Contact Person: Bruce Waddel 462-2010

RM 69 Norton NE 11-12-20 W2 Douslin - 1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Black and Brown Dot released in 2000. N 49.9857 W 104.6218

Comments: 3500 released on wildlife land July 30.

Contact Person: Rocky Coleman 787-1040 SE

RM 69 Norton NE 11-12-20 W2 Douslin - 2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Black and Brown Dot released in 2000. N 49.9857 W 104.6218

Comments: 2500 released on wildlife land July 30.

Contact Person: Rocky Coleman 787-1040 SE

RM 74 Wood River NE 9-7-6 W3 Springer US1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**5 to 20**		5				
Monitored in 2003	**1 to 3**		4	51			
Monitored in 2004	**2**		22	58			
Monitored in 2005	**1 to 5**		10	64			

10,000 black beetles released on June 22, 2001. N 49.54374 W 106.75469

Comments: 2001: ~ 11 miles south of Woodrow on 610 at bridge crossing Wood River, north side of the river. Adjacent land is farmed - fallow in 2001, site is marked with 4 ft x 1/2 inch PVC pipe. 2002: Release site. Photo 2002 P6 - 020. Rusk1. 50% Black and 50% Black Dot established. 5/sweep near the river. Black Beetles on the river side of the stake. 2003: Black 100%. Circle around stake. 1/sw near stake, 3/sw in foreground. 2003 P9 - 022, 023. 2004: Beetles near the edge of the vegetation. 2004 P16 - 017, 018. 2005: Ants. 100% Black. 2005 P10 - 005(x), 006. GPS1 WP210.

Contact Person: Bob Springer 778-8301; Landowner: Cliff Rusk 472-5692

RM 74 Wood River SE 9-7-6 W3 Springer US2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**12**		4				
Monitored in 2003	**1 to 3**		1	33			
Monitored in 2004	**1**		28	97			
Monitored in 2005	**1 to 4**		11	56			

10,000 black beetles released on June 22, 2001. N 49.54497 W 106.75577

Comments: 2001: ~ 11 miles south of Woodrow on 610 at bridge crossing Wood River, west side of the river. Adjacent land is farmed - fallow in 2001, site is marked with 4 ft x 1/2 inch PVC pipe. 2002: Release site. Photo 2002 P6 - 021. Rusk2. Black established. 2003: Black, a few Black Dot. Site photos. 2003 P9 - 024, 025. 2004: Black beetles at the edge. 2004 P16 - 019, 020. 2005: Site, site, ants. 100% Black. 2005 P10 - 001, 002. GPS1 WP211.

Contact Person: Bob Springer 778-8301; Landowner: Cliff Rusk 472-5692

RM 74 Wood River SE 9-7-6 W3 Red and White Stake	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**4**		10				
Monitored in 2003	**1 to 3**		15	23			
Monitored in 2004	**1**		20	76			
Monitored in 2005	**1 to 2**		15	66			

Unknown release.	N 49.54232	W 106.75396

Comments: 2002: Release site. Photo 2002 P6 - 022, 023. Black established. Site by an unknown red and white marker stake. 2003: 1/sw upland, 3/sw in river flat. Black 100%. Site photos 2003 P9 - 019, 020. 2004: Black beetles along the edge of the area. 2004 P16 - 014, 015. 2005: 100% Black. P10 - 004(x), 008. GPS1 WP212.

Contact Person: Bob Springer 778-8301

RM 74 Wood River SE 9-7-6 W3 NE of Bridge 610	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2003	**2**		25	48			
Monitored in 2004	**2 to 5**		18	56			
Monitored in 2005	**1 to 2**		18	46			

Released date unknown.	N 49.54549	W 106.74925

Comments: 2003: Black Dot. Site photo. 2003 P9 - 018. 2004: Cool day, 2/sw at 11:30, 17C and 4 - 5/sw at 1:25, 20C. Most beetles in thinner vegetation. 2004 P16 - 013. 2005: 100% Black Dot. 2005 P10 - 009. GPS1 WP159.

Contact Person:

RM 74 Wood River NW 10-7-6 W3 Springer US3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1 to 2**		8				
Monitored in 2005	**2 to 3**		6	66			

14,000 black beetles released on June 22, 2001.	N 49.54529	W 106.74895

Comments: 2001: ~ 11 miles south of Woodrow on 610 at bridge crossing Wood River, north side of the river. Adjacent land is farmed - fallow in 2001, site is marked with 4 ft x 1/2 inch PVC pipe. 2002: Release site. Photo 2002 P6 - 017. Black and Black Dot established. Filson #1. 2005: 100% Black. B. Springer: up to 5/sweep along edge of river. 2005 P10 - 010. GPS1 WP160.

Contact Person: Bob Springer 778-8301; Landowner: Ben, Dwayne and David Filson 472-5914

RM 74 Wood River NW 10-7-6 W3 Springer US4	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**10**		15				
Monitored in 2003	**1**		10	74			
Monitored in 2004	**2**		10	81			
Monitored in 2005	**1 to 3**		15	46			

10,000 black beetles released on June 22, 2001. N 49.54522 W 106.74736

Comments: 2001: ~ 11 miles south of Woodrow on 610 at bridge crossing Wood River, north side of the river. Adjacent land is farmed - fallow in 2001, site is marked with 4 ft x 1/2 inch PVC pipe. 2002: Release site. Photo 2002 P6 - 018. 20% Black and 80% Black Dot established. 2003: Very dense stand of vegetation. Black. Site photo 2003 P9 - 017. 2004: Beetles at the edge of the mowed strip. 2004 P16 - 010, 011. 2005: 100% Black. B. Springer: up to 3 - 4/sweep along edge of river. 2005 P10 - 011 GPS1 WP209.

Contact Person: Bob Springer 778-8301; Landowner: Ben, Dwayne and David Filson 472-5914

RM 74 Wood River SE 20-7-6 W3 SK-C-90-0008	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**1 to 2**	2 x 2	55	45	51.3	22.6	
Monitored in 2001	**<1**		1	35			
Monitored in 2003	**1**		15				

Brown Dot Beetle Release in 1990. N 49.58175 W 106.77189

Comments: 1995: Site has improved slightly, however beetle numbers still down. Monitored on a cool morning. Site is in amongst junkyard. 1999: Phone survey. Beetles present, leafy spurge is reduced at release site. 2001: Site is located west of house, GPS was recorded near the site. Site is 8 miles south on 610, 2 miles west, 1 mile south. House on road with 4 bins. Leafy spurge is thinned out. 2003: Black Dot. 2003 P9 - 015. GPS1 WP174.

Contact Person: Cliff Rusk 472-5692

RM 74 Wood River SE 9-7-7 W3 98 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**3**		20	76			
Monitored in 2002	**30**		3				
Monitored in 2003	**1 to 3**		20	69			
Monitored in 2004	**2**		25	81			
Monitored in 2005	**1 to 4**		19	71			

Black Beetle released in 1998. N 49.54236 W 106.75466

Comments: Nearest town; Woodrow. 2001: Site is to small for collection. Black beetles are doing well at the edge of a field in a grassland location. Fewer beetles are found on leafy spurge growing with brush. Very little feeding damage. 2002: Release area Photo 2002 P6 - 019. Black and a few Black Dot established. 2003: Very dense vegetation. Black a few Black Dot. Site photo. 2003 P9 - 021 (left ants, right release site with a few ants). 2004: Black beetles at the edge of the leafy spurge patch and quackgrass. 2004 P16 - 016. 2005: 100% Black. 2005 P10 - 007. GPS1 WP161.

Contact Person: Bob Springer 778-8301; Landowner: Clifford Rusk 472-5692

RM 74 Wood River NW 10-7-6 W3 98 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**<1**						
Monitored in 2003	**1**		4	84			
Monitored in 2004	**1**		8	86			

Black Beetle released in 1998. N 49.54529 W 106.74895

Comments: Nearest town; Woodrow. Released near bridge. 2001: Located to the left of the Wood River when traveling south. Very little feeding damage. 2003: Beetle on the river flat, very dense vegetation stand. Black 50% and Black Dot 50%. Site photo 2003 P9 - 016. 2004: Beetles on the hill before the bridge. 50% Black, 50% Black Dot. 2004 P - 012. GPS1 WP160.

Contact Person: Bob Springer 778-8301

RM 75 Pinto Creek SE 28-7-7 W3 Meyronne1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 1**						

Beetles released ??? N 49.58672 W 106.89076

Comments: 2004: 13 UTM 5494399 363341 GPS2 WP528

Contact Person: Dave Shortt 446-7463

RM 75 Pinto Creek SE 28-7-7 W3 Meyronne2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 5**						

Beetles released ??? N 49.58214 W 106.88554

Comments: 2004: 13 UTM 549388 5363705 GPS2 WP529

Contact Person: Dave Shortt 446-7463

RM 75 Pinto Creek NW 20-7-7 W3 Meyronne3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 1**						

Beetles released ??? N 49.57272 W 106.91540

Comments: 2004: 13 UTM 5492888 36152 GPS2 WP530

Contact Person: Dave Shortt 446-7463

RM 75 Pinto Creek NE 6-8-7 W3 Meyronne4	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 1**						

Beetles released ??? N 49.62345 W 106.92915

Comments: 2004: 13 UTM 5498553 360671 GPS2 WP531

Contact Person: Dave Shortt 446-7463

RM 75 Pinto Creek SW 5-8-7 W3 Meyronne5	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 1**						

Beetles released ??? N 49.61342 W 106.91618

Comments: 2004: 13 UTM 5497413 361579 GPS2 WP532

Contact Person: Dave Shortt 446-7463

RM 75 Pinto Creek NE 31-7-7 W3 Meyronne6	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 1**						
Beetles released ???				N 49.60481		W 106.92898	
Comments: 2004: 13 UTM 5496480 360630 GPS2 WP533							
Contact Person: Dave Shortt 446-7463							

RM 75 Pinto Creek SW 28-7-7 W3 Meyronne7	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 1**						
Beetles released ???				N 49.58198		W 106.90320	
Comments: 2004: 13 UTM 5493895 362428 GPS2 WP534							
Contact Person: Dave Shortt 446-7463							

RM 75 Pinto Creek NW 22-7-7 W3 Meyronne8	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**1**						
Beetles released ???				N 49.57887		W 106.87984	
Comments: 2004: 13 UTM 5493507 364108 GPS2 WP535							
Contact Person: Dave Shortt 446-7463							

RM 75 Pinto Creek NW 22-7-7 W3 Meyronne9	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0**						
Beetles released ???				N 49.57865		W 106.87755	
Comments: 2004: 13 UTM 5493478 364273 GPS2 WP536							
Contact Person: Dave Shortt 446-7463							

RM 75 Pinto Creek NW 22-7-7 W3 Meyronne10	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**1 to 2**						

Beetles released ??? N 49.57979 W 106.87407

Comments: 2004: 13 UTM 5493598 364528 GPS2 WP537

Contact Person: Dave Shortt 446-7463

RM 75 Pinto Creek SW 21-7-7 W3 SK-N-90-0055	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**15 to 20**	unlimited	10	30	89.8	8	

Black Dot Beetle Release in 1990. N 49.5710 W 106.8977

Comments: 1995: Excellent collection site, 19 collections in total were made. 1999: Phone survey. Ample beetles, leafy spurge stand is reduced. Site is on the Meyronne Provincial Pasture.

Contact Person: Al Bakke 694-3535

RM 79 Arlington NW 28-7-21 W3 Springer Late 1980^{s}	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**1 to 2**		2	40			

Black Dot released in the late 1980's. N 49.58462 W 108.78555

Comments: Sunny, warm, very little wind when monitored in 2000. Organic producer. Excellent control. Producer (Susan ?) is happy with control. GPS1 WP013.

Contact Person: Mike Sherven 478-2323; Trevor Lennox 297-5450; B. Springer 778-8301

RM 79 Arlington W 27-7-21 W3 SK-C-90-0009	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**15 to 20**	unlimited	30	40	52	23	

Brown Dot Beetle Release in 1990. N 49.5892 W 108.7779

Comments: 1995: Site doing very well, amount of spurge has been dramatically reduced. 1999: Phone survey. Beetles disappeared, so site was sprayed with Tordon 22K in 1998. 2001: Site lost.

Contact Person: Howard Bock 295-3875

RM 99 Caledonia SW 12-12-20 W2 Carlson 99a	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**<1**		12	38			

2000 Black beetles released on July 14, 2003. N 49.97088 W 104.61545

Comments: Released on waste land. NE of yard, take road from south. About 100 ft south west of bridge on #6. 2004: Black. 2004 P11 - 001, 002. GPS2 WP434.

Contact Person: C. W. Carlson 586-4602; Landowner: Steve and Joanne McCheyne 586-1936

RM 99 Caledonia SW 12-12-20 W2 Carlson 99b	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004							

2000 Black beetles released on July 14, 2003. N 49.96693 W 104.60817

Comments: Released on waste land in a water run. 2004: Steel stake marks the release point. GPS2 WP435.

Contact Person: C. W. Carlson 586-4602; Renter Howard Ross 436-4433

RM 99 Caledonia NE 11-12-20 W2 Carlson 99c	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2000 Brown Dot beetles released on July 16, 2003. N 49.83592 W 104.6298

Comments: Released on wildlife land, 100 ft SW of wooden bridge. Wooden stake marks the release spot. GPS2 WP436.

Contact Person: C. W. Carlson 586-4602; Landowner: Conrad Olson 787-2385

RM 99 Caledonia SW 12-12-20 W2 Carlson 99d	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????	**0**		10	51			

2000 Brown Dot beetles released on July 16, 2003. N 49.97980 W 104.62208

Comments: Released on waste land, south of road, north of the creek. Steel stake marks the release point. 2004: No photo. GPS2 WP437.

Contact Person: C. W. Carlson 586-4602; Renter Howard Ross 436-4433

RM 99 Caledonia NW 01-12-20 W2 Carlson 99e	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

2000 Brown Dot beetles released on July 16, 2003. N 49.84362 W 104.61875

Comments: Released on waste land, south of road and across field. GPS2 WP438.

Contact Person: C. W. Carlson 586-4602; Landowner: Steve and Joanne McCheyne 586-1936

RM 99 Caledonia NW 01-12-20 W2 Carlson 99f	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Black and Black Dot released on July 14, 2005 N 49.96789 W 104.61570

Comments: Released north of McShane yard, north of creek. GPS2 WP560.

Contact Person: C. W. Carlson 586-4602; Landowner: Don and Nancy Jones.

RM 99 Caledonia SW 31-11-19 W2 Carlson 99g	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Black and Black Dot released on July 14, 2005 N 49.94662 W 104.59315

Comments: Released north of creek. GPS2 WP561.

Contact Person: Black and Black Dot released on July 14, 2005

RM 108 Name NE 31-11-18 W3 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**<1**		30	38			
Monitored in 2005	**2**		5	43			

Black Beetle released in 1998. N 49.95754 W 108.44274

Comments: Nearest town; Gull Lake. 2001: Some beetles were released north 1000 - 2000 ft up the valley, 3/sweep, beetles are all over the patch. 2005: 100% Black. Site. 2005 P10 - 022. GPS1 WP144.

Contact Person: Trevor Lenox 297-5450, Landowner: Morley Johnson 672-3643

RM 109 Carmichael NE-11-11-20 W3 SK-N-88-0017	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**2 to 4**	70 x 30	25	30	57	23.5	
Monitored in 2001	**1**		10	30			

Black Dot Beetle Release in 1988. N 49.90010 W 108.62002

Comments: 1995: All that remains is isolated pockets of spurge. The number and density of beetles are down. In 1995, recommend that no collections be made here for a few years. Site not monitored since 1995. 2001: Leafy spurge is thinned out but some plants set seed. Low numbers were recorded because of rain. Many beetles were observed on plant stems. GPS1 WP147.

Contact Person: Howard Wedrick 672-3963

RM 109 Carmichael SE 16-11-20 W3 SK-N-88-0016	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**5**	unlimited	75	65	57	23.5	
Monitored in 2001	**5**		20	35			
Monitored in 2004	**3 to 5**		10	51			

Black Dot Beetle Release in 1988. N 49.90373 W 108.66798

Comments: 1995: Area is quite rocky which may be limiting the success of the beetle. In 1995 the site was not improving. Site not visited since 1995. 2001: Leafy spurge is thinned out, but some plans have seed heads. Control was poor in the rocky areas. In 2001, Tordon 22K and Amitrol were applied. A collection site. 2004: Black Dot. 2004 P14 - 020, 021 (valley with no leafy spurge). GPS1 WP145.

Contact Person: Howard Wedrick 672-3963

RM 109 Carmichael SE 16-11-20 W3 1990-93 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**3 to 5**		10	48			
Monitored in 2004	**5 to 6**		1	51			

Black Dot Beetle Release in 1990-93. N 49.90423 W 108.66808

Comments: 2001: Tordon 22K and Amitrol were applied. 1 10 ft circle present, within the circle, a few spurge set seed and a small number of plant with vegetative growth were present. 2004: 90% Black Dot, 10% Black. 2004 P14 - 012. 1990-93 Release.

Contact Person: Howard Wedrick 672-3963

RM 125 Chester NE 35-15-7 W2 SK-C-90-0004	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**5**	10 x 2	36	50	61.6	15.1	0

Brown Dot Beetle Release in 1990. N 50.3058 W 102.8536

Site has seriously declined, extent of borders has contracted. Possibly excessive moisture.

Contact Person: Unable to contact Murray Hextall 224-4333

RM 129 Bratt's Lake NW 26-13-21 W2 Carlson 129a	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

500 Brown Dot Beetles Released on July 16, 2003. N 50.11718 W 104.76503

Comments: Released on SK Highways right-of-way, in the south ditch. Unknown herbicide applied. Beetles left in container for an unknown time before release. GPS2 WP439.

Contact Person: C. Carlson 586-4602; Landowner: Regina District, SK Highways

RM 131 Baildon SE 25-15-26 W2 Farmer Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**1 to 3**	3 x 8	85	80			

Brown Dot Beetle Release in 1990. N 50.2840 W 105.4431

Comments: 1995: Site is not doing well. Beetles have moved up slope and away from the stake. There is little evidence of feeding damage and the spurge is very lush. 1999: Phone survey. In 1998, site not doing well.

Contact Person: Don Swenson 693-2157

RM 152 Spy Hill NW 7-19-31 W1 SK-C-90-0005	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>20**	unlimited	25*	40	38	37.6	10*

Brown Dot Beetle Release in 1990. N 50.6167 W 101.7744

Comments: 1995: Excellent site. Spurge is patchy. Beetles located throughout area. 1999: Phone survey. Not an abundant number of beetles. This was a consistent site but trees limited beetle spread. Collection were made in 1997 and 1998.

Contact Person: Bernie Mikolas 745-2579

RM 154 Sakimay Rsv. East of Bl. Dot Band Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**1**	20x21	50	60			15

Brown Dot Beetle Release From Maxim in 1991.

Comments:

Contact Person: Ken Acoose 697-2831

RM 154 Sakimay Rsv. South of Bl. Dot Band Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**4**	40x16	65	42			40

Brown Dot Beetle Release From Maxim in 1991.

Comments:

Contact Person: Randy Acoose 794-2265

RM 157 South Qu'Appelle NE 10-18-15 W2 SK-C-89-0026	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**5 to 10**	30 x 40	45	50	61.5	20	

Brown Dot Beetle Release in 1989. N 50.5096 W 103.9764

Comments: 1995: Site doing well, beetles in exposed areas. Contact George for 2 mile walk. Site not visited since 1995.

Contact Person: George Pauliuk 699-2511

RM 157 South Qu'Appelle NE 10-18-15 W2 Farmer Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**1**	4	70	65			

Brown Dot Beetle Release in 1990 From Maxim. N 50.5096 W 103.9764

Comments: 1995: Site doing poorly with little evidence of damage. Spurge is very lush, shading the beetles. Site monitored on a cool day with wet conditions. Site not visited since 1995.

Contact Person: George Pauliuk 699-2511

RM 157 McLean George Pauliuk's Farmer Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**2 to 3**	3 x 4	75	60			

Brown Dot Beetle Release in 1991 From Maxim.

Comments: 1995: Little evidence of insect damage present, site doing poorly. Site not visited since 1995.

Contact Person: George Pauliuk 699-2511

RM 158 Edenwold NW 9-17-17 W2 Rapp1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

1000 released on July 15, 2003 N 50.4259 W 104.2915 Cal

Comments:

Contact Person: Landowner: Ron Preikchat 761-0263

RM 158 Edenwold SW 10-19-18 W2 Rapp2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

1000 released on July 15, 2003. N 50.5859 W 104.4240 Cal

Comments:

Contact Person: Landowner: Shirley Agosowicz 781-4716

RM 158 Edenwold SW 18-17-17 W2 SCWW	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2003	**1**		6	69			

Black beetles released on 31 July 2000. N 50.42655 W 104.33625

Comments: 2000: Released SE on Highway 48 from White City, to Edott Rd., turn south past the first yard on the east side, enter the gate, head SE across pasture to creek bottom. 2003: Black 100%. Site photo and patch to south with no beetles. 2003 P9 - 012, 013. GPS2 WP300.

Contact Persons: Neal Wilson 787-1786 SWA; Landowner: Paul Sattler 771-2043

RM 158 Edenwold NW 7-17-17 W2 SWCC	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2003	**0**		0				

Black beetles released on 31 July 2000. N 50.41959 W 104.33517

Comments: 2000: Released SE on Highway 48 from White City, to Edott Rd., turn south past the first yard on the east side, enter the gate, head SE across pasture to creek bottom. 2003: No LS plants found, hay field cut and baled. GPS2 WP301.

Contact Person: Neal Wilson 787-1786 SWA; Landowner: Paul Sattler 771-2043

RM 158 Edenwold NW 9-17-17 W2 SK-N-91-0001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**1 to 2**	5 x 10	75	80	91.3	3.28	

Black Dot Beetle Release in 1991. N 50.4223 W 104.2858

Comments: 1995: Site monitored on a cool breezy day, no significant evidence of insect damage. 1999: Phone survey. Few beetles in 1997, very little leafy spurge stand reduction.

Contact Person: Jim Sigmeth 771-2681

RM 158 White Butte Trails SE 26-17-18 W2 AC-96-005	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**1**		2				
Monitored in 2002	**1 to 5**		3				
Monitored in 2003	**30**		2	36			
Monitored in 2004	**<1**		<1 to 10	36 to 41			

Black released in 1996. N 50.45758 W 104.36787

Comments: Nearest City: Pilot Butte. 2000: From this site, 2 new site were put out in 1997, one site south of the gate, on this site some leafy spurge seed head reduction is visible. 2002: Lama and sheep, release site (2), Photo 2002 P8 - 007, 008. 5/sweep at the south stake (A) and 1/sweep at the north stake (B). 2003: In photo, old LS skeletons in foreground show remains of old patch. N stake is 40m north of S stake. Black 100%. Photos, S stake (middle 7/sw, right 11/sw), S stake, N stake. 2003 P9 - 010, 011. 2004: 2004 P - 021 (N site), 022 (N close up), 023 (S site), 024 (S close up). GPS1 WP065.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 158 White Butte Trails NW 26-17-18 W2 AC-96-006	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**0**						
Monitored in 2003	**0**		8	36			

Black released in 1996. N 50.46913 W 104.37696

Comments: Nearest City: Pilot Butte. Found a lot of ants on the release site. 2003: Site photo. 2003 P9 - 006. GPS1 WP066.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 158 White Butte Trails NE 26-17-18 W2 AC-96-007	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**2 to 5**		20				
Monitored in 2002	**>1 to 1**		11				
Monitored in 2003	**1 to 5**		3 to 10	8 to 25			

Black released in 1996. N 50.46562 W 104.38278

Comments: Nearest City: Pilot Butte. Two release sites nearby, only one established, A SE area looked after by SWF. 2002: Release site. Photo 2002 P8 - 004, 005. A is 1st stake (1 Black Dot/sweep) and B is 2ond stake (<1 Black/sweep). SWF land. There is a lot of litter on the soil. 2003: Black 100%. N site (1 - 3/sw), S site (1 - 5/sw). In the opening 10/sw, all Black. N and S Site photos. 2003 P9 - 007, 008. GPS1 WP067.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 158 Edenwold SW 10-19-18 W2 Rel 97	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**3**	18	10	50			
Monitored in 2002	**<1 to 2**		2				
Monitored in 2003	**4 and 1 to 10**		10	36			
Monitored in 2004	**<1 to 12**		3	71			
Monitored in 2005	**1**		7	79			

Black released in 1997. N 50.59318 W 104.43122

Comments: 1999: Beetles are expanding in a holding pasture for horses. 2002: Photo 2002 P8 - 011. Pasture not grazed. <1 near stake and 1 - 2 along the fence. To much litter. 2003: Black 100%. Beetles in leafy spurge along the fence. 2003 P3 - 3, P9 - 014 (1/sw by stake and 11/sw by corner). 2004: 2004 P7 - 001, 002, 003. 2005: 100% Black. Leafy spurge in uncut brome. Leafy spurge mowed to fence. 2005 P4 - 017. GPS1 WP215.

Contact Person:

RM 159 City of Regina NW 33-17-20 W2 SK-C-91-0005	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1992	**0**	0	60	38			50
Monitored in 1993	**0**	0	60	38			50
Monitored in 2002	**<1**		0				
Monitored in 2003	**2 to 8 3 to 7**		8	36			
Monitored in 2004	**0, <1**		<1	30 - 51			
Monitored in 2005	**0**		0	0			

Brown Dot Beetle released during 1991. N 50.47692 W 104.69602

Comments: 1993: Site died out by the Normanview Pines apartments. 2001: About 1996 several releases of black beetles were made on this parcel of industrial land. This site by the Joanne Goulet Golf Course became an excellent site for collection. On the site most of the beetles were black but some were brown dot. By 2001, the population of leafy spurge had complete disappeared. 2002: Area, short leafy spurge, close up. Photo 2002 P8 - 001, 002, 003. Black and Black Dot. JGCC. 2003: Site photo. 2003 P1 - 001, 002 Black 100%. Photos 25 paces from fence, going east. 2003 P7 - 001, 002, 003, 004, 005, 006, 007, 008, 009, 010. 2004: 2004 P4 - 013. 014, 015, 016, 017, 018, 019, 020, 021. 2005: Site under development for housing development. GPS1 WP162.

Contact Person:

RM 159 City of Regina SW 27-17-20 W2 Island	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**25**	unlimited	25	30		heavy	
Monitored in 2001	**1**						

Black Spurge Beetle Release (*A. lacertosa*) in 1991. N 50.45838 W 104.66999

Comments: 1995: Site doing excellent. Significant reduction in the amount of spurge present. Beetles were collected and moved to northwest corner of Regina along creek. 1999: Phone survey. In 1997 beetles present, leafy spurge stand is reduced. GPS1 WP138.

Contact Person: Taz Stewart 777-7730

RM 159 City of Regina SW 27-17-20 W2 Island	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**12**			50			

Black Spurge Beetle Release (*A. lacertosa*) in 1991. N 50.45838 W 104.66999

Comments: 1995: Site doing excellent. Significant reduction in the amount of spurge present. Beetles were collected and moved to northwest corner of Regina along creek. 1999: Phone survey. In 1997 beetles present, leafy spurge stand is reduced. 2001: Reduced leafy spurge density but some plants flowered and set seed. GPS1 WP138.

Contact Person: Taz Stewart 777-7730

RM 159 City of Regina NW 28-17-19 W2 Rel 98	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**1**	13					
Monitored in 2000	**2 to 7**		<1				
Monitored in 2001	**1 to 2**						
Monitored in 2002	**1 to 2**						
Monitored in 2003	**1**		0	10			
Monitored in 2004	**<1**		0				
Monitored in 2005	**2**		0	15			

Black Beetle released in 1998. N 50.46356 W 104.56072

Comments: 2000: Herbicides were applied in strips but all of the area was not sprayed. Leafy spurge was sampled outside the herbicide treated areas. 2001: 1 beetle/sweep was found in the herbicide treated area and 2 beetles/sweep was found in the non-herbicide treated patches. Leafy spurge is thinned and is not in patches. Herbicides were applies in strips and beetles were found on herbicide treated plants. 2002: Release area. Photo 2002 P7 025, 026. Lots of ants. Site mowed. 2003: Very few plants and beetles. Site photo and plant. 2003 P7 - 011, 012. 2004: Black 6 beetles on one plant and 0 on 5 plants. 2005: 100% Black Dot. Only 5 leafy spurge plants found. 2005 P8 - 021. GPS1 WP064.

Contact Person: A. Sandalack 777-7081; Landowner: City of Regina

RM 160 Pense NE-19-18-24 W2 SK-N-89-0021	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**8 to 10**	80 x 150	35	45	81.5	10	

Black Dot Beetle Release in 1989. N 50.5388 W 105.2825

Comments: 1995: Site doing very well. Beetles have moved uphill. Large number of non-flowering stems. Collections can be made at this site. 1999: Phone survey. Beetle present.

Contact Person: Brian Short 345-2514

RM 161 Moose Jaw SW 33-16-26 W2 Black Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**5**	8	35	26			
Monitored in 2001	**1**		20	50			
Monitored in 2002	**1**		5				
Monitored in 2003	**3 to 4**		5	51			
Monitored in 2004	**<1**		0	58			
Monitored in 2005	**2 to 10**		8	53			

Black released in ??? N 50.38296 W 105.51910

Comments: Released to the left of the tree. Brown dot were found further to the north. 2001: Released by Dale Risula. Leafy spurge is thinned out but there are seed heads. 2002: Release area. Photo 2002 P8 - 26 P9 - 001. 2003: Black and a few Black Dot. Site photo. 2003 P8 - 023. 2004: 2004 P5 - 017, 018, 019. 2005: 100% Black. 2005 P3 - 021. GPS1 WP155.

Contact Person:

RM 161 Moose Jaw SW 33-16-26 W2 Br Dot Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**3**		20	46			
Monitored in 2002	**2**		1				
Monitored in 2003	**3 to 4**		1	56			
Monitored in 2004	**<1**		2	61			
Monitored in 2005	**3 to 5**		6	58			

Br Dot released in 1998 N 50.38312 W 105.51874

Comments: Brown dot were found further to the north black beetle release site. 2001: City released to the north of a previous release by the stake. Many vegetative shoots with a few plants with seed heads. 2002: Release site, close up, area. Photo 2002 P9 - 002, 003, 004. Black with a few Black Dot. 2003: Black 60% and Black Dot 40%. Site photo (Blacks in tree shade). 2003 P8 - 024. 2004: 2004 P5 - 016. 2005: 100% Black. 2005 P3 - 022. GS1 WP156.

Contact Person:

RM 161 Moose Jaw Water Reservoir City Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2003	**6 to 10**		1	30			
Monitored in 2004	**1 to 2**		6	41			
Monitored in 2005	**5 to 22**		6	46			

Released date unknown N 50.38512 W 105.62129

Comments: 2003: Released north of birdhouse. Mostly Black, few Black Dot. Site photo. 2003 P8 - 022. 2004: 2004 P5 - 015. 2005: 100% Black. 2005 P3 - 020. GPS1 WP023.

Contact Person: Glen Chernick 694-4439

RM 161 Moose Jaw Wakamow Valley Farmer Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**50**	unlimited	35	25			40

Brown Dot Beetle Release in 1991.

Comments: 1995: Previous to 1994, the site was doing extremely well. 1999: Phone survey. In 1998, presence of beetles unknown and no sign of leafy spurge reduction.

Contact Person: Glen Chernick 694-4439

RM 162 Besant Campground NW 29-17-29 W2 1998 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**20**	30m	18	21			
Monitored in 2001	**5 to 15**		5	35			
Monitored in 2002	**3**		10				
Monitored in 2003	**10**		20	53			
Monitored in 2004	**3 to 4**		20	46			
Monitored in 2005	**6 to 9**		9	46			

Black Beetle released in 1998. N 50.46338 W 105.96128

Comments: 1999: Excellent site. 2001: Leafy spurge is thinned out but some plants are setting seed. A collection site. 2002: Release area. Site, close up, area. Photo 2002 P8 - 017, 018, 019. Black and a few Black Dot. 2003: Site photo. 2003 P4 - 008. 2004: 2004 P5 - 009. 2005: 95% Black, 5% Black Dot. Suitable for picking. 2005 P3 - 015, 016. GPS1 WP139.

Contact Person:

RM 161 Moose Jaw SW 35-16-27 W2 1998 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**2**						
Monitored in 2001	**<1**		5	35			
Monitored in 2002	**<1**		20				
Monitored in 2003	**0**		8	64			
Monitored in 2004	**1 to 2**		33	41			
Monitored in 2005	**1 to 2**		15	43			

Black Beetle Released in 1998. N 50.38488 W 105.61079

Comments: 1999: Could not find the release site. 2001: Leafy spurge appears thin but many of the plants have seed heads. 2002: Release area, area. Photo 2002 P8 - 024, 025. 2003: Grazed. Site photo 2 hawkmoth. 2003 P8 - 019, 020, 021. 2004: 2004 P5 - 014. 2005: 100% Black. 2005 P3 - 019. GPS1 WP157.

Contact Person: Landowner: Robert Hayward 693-0434

RM 162 Caron NE 29-17-29 W2 SK-N-87-0001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**1 to 3**	unlimited	40	30	90+		
Monitored in 1999	**30**		10	20			
Monitored in 2002	**3 to 4**		3				
Monitored in 2003	**4 to 7**		4	38			
Monitored in 2005	**4**		2	43			

Black Dot Beetle Release in 1987. N 50.46015 W 105.96267

Comments: 1995: Not many beetles found, possible error in site location as contact was unsure of exact spot. 1999: Excellent site beetles have moved along the road. 2002: Release site, right of release site, left of release site, nearby valley. Photo 2002 P8 - 020, 021, 022, 023. 2003: Not grazed. Black Dot. Site and area photos. 2003 P9 - 004, 005. 2005: 100% Black Dot. Leafy spurge release site 1(p3 - 013) and area over hill to the north. 2005 P3 - 013, 014. GPS1 WP217.

Contact Person: Cameron Duffy 692-5121

RM 162 Caron-Besant NW 29-17-29 W2 SK-C-90-0001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**4 to 6**	6 x 6	80	35			
Monitored in 1999	**15**		6	18			
Monitored in 2001	**4**		1	25			
Monitored in 2002	**2 to 3**		5				
Monitored in 2003	**3 to 6**		18	64			
Monitored in 2004	**3 to 10**		9	48			
Monitored in 2005	**4 to 5**		13	43			

Brown Dot Beetle Release in 1990. N 50.46015 W 105.96267

Comments: 1995: Specific release point unknown, general site area cleared of spurge with isolated pockets remaining. Beetles may be running out of spurge. 1999: Excellent site. Beetles present, leafy spurge thinned out. 2001: Leafy spurge thinned out but some plants have seed heads. Leafy spurge is cleaned off the hill. 2002: Photo 2002 P8 - 012, 013, 014, 015 (release area), 016 (release area). Site is on the walking trail behind the campground. 2003: Photo 2003 P4 - 009. 2004: 2004 P5 - 010, 011, 012, 013. 2005: 100% Black Dot. Suitable for collection. 2005 P3 - 017, 018. GPS1 WP216.

Contact Person:

RM 162 Caron-Besant NW 29-17-29 W2 SK-N-91-0007	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**10 to 20**	unlimited	30	35	96.7	1.84	

Bl Dot Beetle Release in 1990. N 50.4660 W 105.9585

Comments: 1995: Excellent site, 11 collections were made. Beetles have advanced to cover entire hillside. 1999: Phone survey. Number unknown, may have controlled leafy spurge. 2001: Few black beetles present.

Contact Person:

RM 163 Wheatlands SW 13-17-1 W3 SK-N-86-0004	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**10**	unlimited	30	40	58	17	5

Black Dot Beetle Release in 1986. N 50.4296 W 106.0172

Comments: 1995: Beetles found throughout area in varying densities. Approx. 12 collections made. 1999: Phone survey. Beetles are present, spurge is reduced in release area. This site is adjacent to the sheep pasture. 2001: poor site, no evidence of damage.

Contact Person: Ed. Jaeger 355-2716 or 355-2233 (RM)

RM 163 Wheatlands SW 3-18-2 W3 SK-N-90-0053	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**10**	unlimited	30	30	88.1	7.06	10
Monitored in 2001	**3**		5	40			
Monitored in 2003	**8 to 9**		8	38			
Monitored in 2005	**14 to 30**		5	43			

Brown Dot Beetle Release in 1990. N 50.48777 W 106.20914

Comments: 1995: Beetles present in decent numbers, spurge still dominant (somewhat patchy). Approximately 10 collections made. 1999: Phone survey. Beetles are present, spurge is reduced in release area. 2001: Leafy spurge is thinned out, some seed heads. A large area has been thinned out. 2003: Grazed Black Dot. Site photo, LS thinned out, LS on left has 7/sw. 2003 P9 - 001, 002, 003. 2005: 100% Black Dot. 2005 P3 - 024, 025, 026. GPS1 WP158.

Contact Person: Ed. Jaeger 355-2716 or 355-2233 (RM)

RM 163 Wheatlands SW 26-17-1 W3 SK-C-92-0020	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>20**	15 x 3	30	33			30

Brown Dot Beetle Release in 1992. N 50.4587 W 106.0401

Comments: 1995: Site took well, doing well. 1999: Phone survey. Beetles are present, spurge is reduced in release area. 2001: Small patch in a cultivated field. Will never be a collection site.

Contact Person: Ed. Jaeger 355-2716 or 355-2233 (RM)

RM 184 Grayson NW 29-18-4 W2 SK-N-87-0003	**No. of Beetles / Sweep**	**Beetle Diameter (m)**	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**2 to 50**	unlimited	0 to 2	10	39	33.8	15

Black Dot Beetle Release in 1987. N 50.5533 W 102.5212

Comments: 1995: Site not checked in 1995. Previously the site was doing excellent with significant spurge reduction and beetle collections made. Few beetles at release site, they have moved along the hills to the adjacent south facing slope. 1999: Phone survey. Beetles active, leafy spurge is reduced.

Contact Person: David Safton 696-2975

RM 184 Grayson NW 29-18-4 W2 SK-C-86-0001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	1	unknown	60	60	52	24	5

Brown Dot Beetle Release in 1986. N 50.5533 W 102.5212

Comments: 1995: Site not checked in 1995. 1999: Phone survey. Beetles active, leafy spurge is reduced as are the beetle numbers.

Contact Person: David Safton 696-2975

RM 185 McLeod SE 16-21-9 W2 SK-C-91-0013	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**1 to 3**	2 x 3	40	30			10

Brown Dot Beetle Release in 1991. N 50.8009 W 103.1909

Comments: 1995: Beetles present but not in sufficient numbers to collect.

Contact Person: Unable to contact, Murray Hanowski 748-2233

RM 185 McLeod SW 4-21-9 W2 SK-C-92-0026	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	1	2 x 11	65	70			5

Brown Dot Beetle Release in 1992. N 50.7714 W 103.2026

Comments: In 1996, beetles present and leafy spurge reduced at release stake.

Contact Person: Garry Lubachowski 335-2791

RM 189 Lumsden NW 15-21-22 W2 SCWW wpt 62	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**2**		0				
Monitored in 2003	**3 to 12**		2	33			
Monitored in 2004	**7 to 15**		6	30			
Monitored in 2005	**2 to 3**		10	41			

Mostly black beetles released on June 28, 2000 N 50.78410 W 104.97673

Comments: 2000: North end of pasture, west of the entrance from the highway. 2002: Release site. Photo 2002 P7 - 021. Pasture was sheep grazed. 2003: very light grazing. Black 100%. Site photo (most beetles near flowering plants). 2003 P7 - 014. 2004: Sampled to the right of the materials dump area. Black Dot. 2004 P11 - 022, 023, 024. 2005: 100% Black Dot. Photograph of area and site. 2005 P6 - 001, 002. GPS2 WP302.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Jamie Sinclair.

RM 189 Lumsden SW 15-21-22 W2 SCWW wpt 61	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**<1**		0				
Monitored in 2003	**3 to 13**		0				
Monitored in 2004	**1 to 2**			56			
Monitored in 2005	**3 to 5**		16	46			

Mostly black beetles released on June 28, 2000 N 50.78195 W 104.96822

Comments: 2000: SE of highway entrance on edge of patch near wolfwillow. 2002: Release site. Photo 2002 P7 - 022. Pasture was sheep grazed, sheep rotated. 2003: Very light grazing. Mostly Black Dot, few Blacks. Site photo and patch in background. 2003 P7 - 015, 016, 017. 2004: 5% Black, 95% Black Dot. 2004 P11 - 015. 2005: 100% Black Dot. Photograph of site and closeup. 2005 P6 - 003, 004. GPS2 WP303.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Jamie Sinclair.

RM 189 Lumsden SE 1-21-22 W2 SCWW wpt	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1**		20				
Monitored in 2003	**1 to 2**		17	64			
Monitored in 2004	**1 to 2**		16	69			
Monitored in 2005	**0 to 2**		40	69			

Mostly black beetles released on June 28, 2000 N 50.74832 W 104.91576

Comments: 2000: East of trough towards east fence boundary. 2002: Release area. Photo 2002 P5 - 25. Black Dot. 2003: Pasture grazed. Site photo. 2003 P8 - 012. 2004: Black Dot. 2004 P8 - 016. 2005: 100% Black Dot. 0 at release, 1 to 2 on the patch edge. 2005 P6 - 021, 022. GPS2 WP304.

Contact Person: J. Oliver 535-9760 SWA; Landowner: George Grassick

RM 189 Lumsden SE 1-21-22 W2 SCWW wpt 67	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**10**		4				
Monitored in 2003	**3**		1	30			
Monitored in 2004	**8**		4	43			
Monitored in 2005	**1 to 2**		7	46			

Mostly black beetles released on June 29, 2000 N 50.75015 W 104.91799

Comments: 2000: At edge of 4th transect east-end of quarter section. 2002: Photo 2002 P6 - 003. Most are Black Dot in the middle of the patch which has thinned. 2003: No grazing. Black Dot. Site photo. 2003 P8 - 006. 2004: Black Dot. 2004 P8 - 002. 2005: 100% Black Dot. Site and closeup. 2005 P7 - 011, 012. GPS2 WP305.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Gord Ewen.

RM 189 Lumsden NW 1-21-22 W2 SCWW wpt 69	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1 to 2**		5				

Mostly black beetles released on June 28, 2000 N 50.75383 W 104.93170

Comments: 2000: Fenceline between Harrison's and Ewen's, south of Harrison's yard. 2002: Photo 2002 P6 004. Mostly Black Dots with a few Black beetles. Released near a fenceline. A low number of leafy spurge plants present. GPS2 WP306.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Tom Harrison

RM 189 Lumsden NE 11-21-22 W2 SCWW wpt 64	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1**		10				
Monitored in 2003	**3**		5	41			
Monitored in 2004	**8**		12	36			
Monitored in 2005	**10**		12	43			

Mostly black beetles released on June 29, 2000 N 50.77325 W 104.94150

Comments: 2000: Release site. Photo 2002 P6 - 007. Directly across from 2nd railway tie from fence. Black Dot. 2003: No grazing. Black Dot. Site photo. 2003 P8 - 001. 2004: Black Dot. 2004 P9 - 014, 015. 2005: 100% Black Dot. Site and closeup. 2005 P6 - 015, 016. GPS2 WP307.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Doug Danyliw

RM 189 Lumsden NE 11-21-22 W2 SCWW wpt 63	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**<1**		10				
Monitored in 2003	**1**		3	38			
Monitored in 2004	**2**		5	30			
Monitored in 2005	**1**		9	38			

Mostly black beetles released on July 10, 2000 N 50.77310 W 104.94035

Comments: 2000: Close to 2nd railway tie from the fence. 2002: Release site. Photo 2002 P6 - 008. Black Dot. 2003: Black Do. No grazing. Site photos. 2003 P7 - 024, 025. 2004: Black Dot. 2004 P9 - 016, 017. 2005: 100% Black Dot. 2005 P6 - 014. GPS2 WP308.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Doug Daniela

RM 189 Lumsden NE 11-21-22 W2 SCWW wpt 66	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**4**		5				
Monitored in 2003	**1**		0	15			
Monitored in 2004	**11**		1	30			
Monitored in 2005	**1**		0	41			

Mostly black beetles released on July 10, 2000 N 50.77253 W 104.94155

Comments: 2002: Photo 2002 P6 - 006. Black Dot with a few Black beetles. Beetles on leafy spurge growing with grass and not on leafy spurge growing with wolf willow. 2003: No grazing. Few plants. Site photo. 2003 P8 - 002. 2004: Black Dot. 2004 P9 - 014. 2005: 100% Black Dot. Site and closeup. 2005 P6 - 017, 018. GPS WP309.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Doug Danyliw

RM 189 Lumsden NE 11-21-22 W2 SCWW wpt 65	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**6 to 7**		3				
Monitored in 2003	**8 to 19**		2	36			
Monitored in 2004	**10 to 30**		4	41			
Monitored in 2005	**10 to 13**		3	36			

Mostly black beetles released on July 10, 2000 N 50.77101 W 104.94074

Comments: 2000: Three posts from birdhouse, 13 railway ties south from the gate. 2002: Release site. Photo 2002 P6 - 005. Mostly Black Dots with a few Black beetles. 2003: No grazing. Black Dot and a few Blacks. Site photo and Buena Vesta with LS. 2003 P8 - 003, 004, 005. 2004: Black Dot, 2 Black. 2004 P9 - 010, 011, 012, 013. 2005: 5% Black, 95% Black Dot. 2005 P6 - 019, 020. GPS2 WP310.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Doug Danyliw

RM 189 Lumsden SW 15-21-22 W2 SCWW wpt 60	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1**		0				
Monitored in 2003	**2 to 8**		1	38			
Monitored in 2004	**1**		15	38			

Mostly black beetles released on July 10, 2000 N 50.77914 W 104.96908

Comments: 2000: South end of 1/2 section, near tress, north of pit. 2002: Release site. Photo 2002 P7 - 023. Pasture was sheep grazed, sheep rotated. 2003: Site photo (1/sw), site and background (tall LS 1/sw, low is 8/sw). 2003 P7 - 018, 019, 020. 2004: 2004 P11 - 016, 017. GPS2 WP311.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Janie Sinclair

RM 189 Lumsden SW 15-21-22 W2 SCWW wpt 59	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**7**		0				
Monitored in 2003	**1 to 5**		10	48			
Monitored in 2004	**1 to 9**		10	48			

Mostly black beetles released on July 10, 2000 N 50.77685 W 104.96865

Comments: 2000: South end of 1/2 section, near tress, north of pit. 2002: Release site. Photo 2002 P7 - 024. Pasture was sheep grazed. More bare ground than other sites in the area. 2003: Very light grazing. Black Dot. Site photo (1/sw), near back (3/sw) in back (6/sw), site large LS (5/sw). 2003 P7 - 021, 022, 023. 2004: Black Dot. 2004 P11 - 018, 019. GPS2 WP312.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Janie Sinclair

RM 189 Lumsden SE 1-21-22 W2 SCWW wpt	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**3 to 6**		3				
Monitored in 2003	**11**		15	41			
Monitored in 2004	**5 to 8**		11	36			
Monitored in 2005	**6 to 14**		20	41			

Mostly black beetles released on July 10, 2000 N 50.74930 W 104.91615

Comments: 2002: Release area. Photo 2002 P6 - 001. Black Dot. 2003: Pasture grazed. Site photo. 2003 P8 - 013. 2004: Black Dot. 2004 P8 - 017. 2005: 100% Black Dot. Site and area. 2005 P6 - 023, 024. GPS2 WP313.

Contact Person: J. Oliver 535-9760 SWA; Landowner: George Grassick

RM 189 Lumsden SE 1-21-22 W2 SCWW wpt 38	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**3 to 5**		8				
Monitored in 2003	**2 to 4**		9	43			
Monitored in 2004	**1**		15	36			
Monitored in 2005	**1**		15	46			

Mostly black beetles released on July 10, 2000 N 50.74978 W 104.91705

Comments: 2000: Along roadside on east side before brush, in gap between tree stand. 2002: Photo 2002 P6 - 002. Mostly Black Dot, a few Black beetles were found behind the stake in the photo with western snowberry. 2003: No grazing. Black Dot. Site photo. 2003 P8 - 008. 2004: Black Dot. 2004 P8 - 023. 2005: 100% Black Dot. Release site. 2005 P7 - 013. GPS2 WP314.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Gord Ewen

RM 189 Lumsden SE 1-21-22 W2 SCWW wpt 31	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**3 to 5**		5 to 12				
Monitored in 2003	**3 to 5**		1	28			
Monitored in 2004	**7 to 9**		4	41			
Monitored in 2005	**3 to 6**		3	41			

Mostly black beetles released on July 10, 2000 N 50.74833 W 104.91752

Comments: 2000: Directly west of Grassick's trough, up on ridge. 2002: Photo 2002 P5 - 022, 023. 3 to 5/sweep by the rebar and 3/sweep by the red stake. 2003: No grazing. Black Dot. Site photo (3/sw by stake, 5 right stake 5/sw) 2003 P8 - 010. 2004: Black Dot. 2004 P8 - 018, 019, 020. 2005: 100% Black Dot. Photograph of area, site and closeup. 2005 P7 - 001, 002, 003. GPS2 WP315.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Gord Ewen

RM 189 Lumsden SE 1-21-22 W2 SCWW wpt 68	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**3 to 5**		8				
Monitored in 2003	**3 to 7**		5	41			
Monitored in 2004	**8 to 17**		9	41			
Monitored in 2005	**1 to 2**		11	41			

Mostly black beetles released on July 10, 2000 N 50.74778 W 104.91835

Comments: 2000: North of bush on road, running east-west. 2002: Release site. Photo 2002 P5 - 024. By rebar. No grazing. Black Dot. Site photo (3/sw foreground, 7/sw background). 2003 P8 - 011. 2004: Black Dot. 2004 P8 - 021. 2005: 100% Black Dot. Site and closeup. 2005 P7 - 004, 005. GPS2 WP316.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Gord Ewen

RM 189 Lumsden SE 1-21-22 W2 SK-C-91-0001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**<1**	n/a	50	70	69.4	11.5	10
Monitored in 2000	**3 to 5**	150	20 - 30				
Monitored in 2002	**1**		0				
Monitored in 2003	**13 to 33**		6	43			
Monitored in 2004	**1 to 6**		5	38			
Monitored in 2005	**2 to 5**		8	46			

Brown Dot Beetle Release in 1991. N 50.74900 W 104.91778

Comments: Site has seriously declined for unknown reason. 2000: Beetles are present but are not significantly controlling leafy spurge, small number of beetles over a large area. 2002: Release site. Photo 2002 P7 - 019. Pasture was sheep grazed. 2003: No grazing. Black Dot. Site photo. 2003 P8 - 009. 2004: Black Dot. 2004 P8 - 024. 2005: 100% Black Dot. Site and closeup. 2005 P7 - 007, 008. GPS1 WP061.

Contact Person: Gord Even, Leonard Ebert 731-2706

RM 189 Lumsden SE 1-21-22 W2 SK-C-92-0002	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**<1**	n/a	50	70			10
Monitored in 2000	**5 to 10**	30	2 to 20				
Monitored in 2002	**5**		0				
Monitored in 2003	**2 to 11**		11	48			
Monitored in 2004	**3 to 5**		8				
Monitored in 2005	**3**		9	38			

Brown Dot Beetle Release in 1992. N 50.74978 W 104.91750

Comments: 1995: Site not doing well. Site is located close to a busy road, which may be why it is unsuccessful. 2000: Damage starting. In 2000, sheep grazed the pasture for the first time. 2002: Release site. Photo 2002 P7 - 016, 017, 018. Pasture was sheep grazed. 2003: No grazing. Black Dot. Site photo (11/sw in foreground, 3/sw background) 2003 P8 - 007. 2004: Black Dot. 2004 P9 - 001, 002, 003, 008. 2005: 100% Black Dot. Site and closeup. 2005 P7 - 009, 010. GPS1 WP060.

Contact Person: Gord Even, Leonard Ebert 731-2706

RM 189 Lumsden NW 15-21-22 W2 Black Rel	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**5 to 7**	9	1				
Monitored in 2002	**0**		0				
Monitored in 2003	**3 to 6**		2	36			
Monitored in 2004	**1 to 4**		3	36			
Monitored in 2005	**2 to 3**		3	25			

Black Beetle released in ???. N 50.78505 W 104.98892

Comments: 2000: There is a circle around the stake with excellent control. 2002: Release site. Photo 2002 P7 - 020. No leafy spurge found. 2003: Very light grazing. Black 100%. Site photo. 2003 P7 - 013. 2004: Black. 2004 P11 - 020, 021. 2005: 100% Black. Photograph of area, site with ring, closeup. 2005 P6 - 011, 012, 013. GPS1 WP062.

Contact Person: Gord Even, Leonard Ebert 731-2706

RM 190 Dufferin NW 5-19-24 W2 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**1**		10	76			

Black Beetle released in 1998. N 50.57683 W 105.28085

Comments: Nearest town; Tugaske. GPS1 WP036.

Contact Person: Doug Patience 638-4967, Landowner: Delbert Schmidt 759-2502

RM 190 Dufferin SW 4-19-24 W2 SK-N-89-0010	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>>20**	unlimited	0	0	63	18	10
Monitored in 2001	**8 to 10**		10				

Black Beetle Release in 1989. N 50.5750 W 105.2724

Comments: 1995: Beetles have killed off all spurge within vicinity of release point and have spread to spurge within trees. Approx. 15 collections made. Some beetles relocated. 1999: Phone survey. In 1998, few beetles at release site, beetles moved 1/4 mile, at original site spurge is almost gone. 2001: Walk in 1 mile. The beetles have stunted the plants. Most of the beetles are in the grassland site but a few are in the trees. GPS1 WP115.

Contact Person: Doug Patience 638-4967

RM 190 Dufferin SE 5-19-24 W2 Br Dot Rel 94	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**7**	20	8 to 12	71			

Brown dot released in 1994 N 50.57575 W 105.28525

Comments: Put in a partial shade area. Beetles moved to a sunny location, spurge is thinner. GPS1 WP014.

Contact Person: Doug Patience 638-4967

RM 190 Dufferin SW 5-19-24 W2 Black 98 Rel	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**1**		10	76			

Black released in 1998. N 50.57698 W 105.28085

Comments: Brown dots are present, they came from a nearby release site 300 m. GPS1 WP015.

Contact Person: Doug Patience 638-4967

RM 190 Dufferin SW 4-19-24 W2 Rel 1998	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**10**	30 x 60	6	60			
Monitored in 2005	**1 to 6**		20	46			

Black Beetle released in 1989. N 50.57810 W 105.27775

Comments: Nearest town; Bethune, Control in brush, leafy spurge plants, short and not growing. In areas with small spurge there are ants. 2005: 100% Black Dot. Photograph area, site and closeup, 1 right side, 2 at release site and 6 on the far right. 2005 P6 - 008, 009, 010. GPS1 WP012.

Contact Person: Doug Patience 638-4967, Landowner: Deer Valley Ranch 693-6611

RM 191 Marquis NW 13-21-29 W2 SK-N-87-0004	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**60 to 80**	unlimited	60	70	58	21.5	0

Black Dot Beetle Release in 1987. N 50.7861 W 105.8957

Comments: 1995: Could not monitor in 1995 due to inclement weather conditions. Beetles are at the top of the hill. 1999: Phone survey. Beetles are plentiful.

Contact Person: Larry Smith 759-2656

RM 191 Marquis NE 4-21-28 W2 SK-C-91-0011	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**1 to 2**	3 x 0	80	85	59.7	15.6	0

Brown Dot Beetle Release in 1991. N 50.7569 W 105.8149

Comments: 1995: Could not monitor in 1995 due to inclement weather conditions. 1999: Phone survey. Site not visited for several years.

Contact Person: Landowner: Claudette Haliday, Lynn Anderson 788-4804

RM 191 Buffalo Pound Park release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**2**	4 x 5	75	65			

Brown Dot Beetle Release in 1991 From Maxim.

Comments: 1995: Site doing poorly, possibly due to excessive moisture or shade from trees. Site located north of Minoa release. 1999: Phone survey. In 1998, beetles are present.

Contact Person: Terry Minter 694-3659 or Sherri at the Park 694-3819

RM 191 Buffalo Pound Park release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**3**	7 x 10	45	40			
Monitored in 1999	**1**	13 m	5	66			
Monitored in 2003	**3 to 4**		9	56			

Brown Dot Beetle Release in 1991 From Maxim. N 50.58787 W 105.42287

Release west of entry gate. Release point not staked. Beetles returning to area. Minimal spurge in area as it was sprayed. In 1998, beetles are present. 1999: Leafy spurge is thin but not shorter. 2003: Park. Black Dot 80% and Black 20%. Site photo. 2003 P8 - 018. GPS1 WP016.

Contact Person: Terry Minter 694-3659 or Sherri at the Park 694-3819

RM 191 Buffalo Pound Park release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**2 to 4**	20 x10	70	80			

Brown Dot Beetle Release in 1991 From Maxim.

Comments: 1995: Site located at bottom of river valley. Site doing poorly, likely due to excessive moisture. 1999: Phone survey. In 1998, beetles are present.

Contact Person: Terry Minter 694-3659 or Sherri at the Park 694-3819

RM 191 Buffalo Pound Minoa	**No. of moths**	Colony Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**0**						

Minoa murinata Release in 1991.

Comments: 1995: No evidence of Minoa adults, eggs, or larvae. No evidence of defoliation, although this would not normally become apparent until population builds up. Difficult to determine survival. 1999: Phone survey. Success unknown.

Contact Person: Terry Minter 694-3659 or Sherri at the Park 694-3819

RM 191 Buffalo Pound SE 8-19-25 W2 Bl Dot Rel 1994	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**2 to 6**		5	22			
Monitored in 2003	**11 to 12**		9	43			

Black Dot released in 1994. N 50.58998 W 105.4168

Comments: 1999: Good control around the stake (2/sweep), better control where beetles moved (6/sweep), did not move uphill because of ants. 2003: Black Dot 60% and Black 40%. Site photo. 2003 P8 - 016. GPS1 WP022.

Contact Person: Terry Minter 694-3659 or Sherri at the Park 694-3819

RM 191 Buffalo Pound SE 9-19-25 W2 Black Rel 1998	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**7**	3 x 10	6	45			
Monitored in 2003	**3 to 4**		2	48			

Black released in 1998. N 50.58909 W 105.41580

Comments: Good site, NE slope at top of the hill. 2003: Park. Black 100%. LS shoots not visible in grass. 2003 P8 - 017. GPS1 WP017.

Contact Person: Terry Minter 694-3659 or Sherri at the Park 694-3819

RM 218 Cupar NW 10-22-17 W2 SK-N-89-0015	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**5 to 10**	10 x 40	35	45	71.5	14	

Black Dot Beetle Release in 1989. N 50.8588 W 104.2797

Comments: 1995: Site has improved since 1994. Beetles have moved up and down the slope.

Contact Person: Unable to contact Alan Orb (no phone number)

RM 218 Cupar NW 10-22-17 W2 SK-C-92-0027	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**3**	0	85	70			

Brown Dot Beetle Release in 1992. N 50.8588 W 104.2797

Site not doing well, recommend re-release.

Contact Person: Unable to contact Alan Orb (no phone number)

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 125 LML V	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2003	**15 to 17**		12	43			
Monitored in 2004	**0**						

Mostly black beetles released on 22 June 2001 N 50.77360 W 104.87700

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508673 M 5624438. 2002: Site is located in a bush area with no leafy spurge. 2003: Black 60% and Black - Brown Dot 40%. Site photo. 2003 P5 - 015. 2004: No leafy spurge, western snowberry present. GPS2 WP323.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 126 LML VI	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2002	**2 to 3**		15				
Monitored 2003	**20**		5	41			
Monitored 2004	**15**		6	51			
Monitored 2005	**3 to 5**		6	48			

Mostly black beetles released on 22 June 2001 N 50.77277 W 104.87652

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508707 M 5624345. 2002: Release site. Photo 2002 P7 - 011. Black and Black Dot established. 2003: Black 60% and Black - Brown Dot 40%. Site photos, site (20/sw), nearby patch (35/sw), next nearby patch (11/sw). 2003 P5 - 012, 013, 014. 2004: 95% Black, 2004 P6 - 004, 005. 2005: 100% Black. 2005 P5 - 003, 004. GPS2 WP324.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 127 LML VII	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2002	**2 to 3**		10				
Monitored 2003	**20 to 21**		1	25			
Monitored 2004	**2 to 3**		2	53			
Monitored 2005	**3 to 4**		7	48			

Mostly black beetles released on 22 June 2001 N 50.77252 W 104.87668

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508696 M 5624316. 2002: Release area. Photo 2002 P7 - 012. Estimate made on the north side of the rock. 2003: Black 50% and Black - Brown Dot 50%. Site photos 2003 P5 - 010, 011. 2004: 70% Black - 30% Black Dot. 2004 P6 - 001, 002, 003. 2005: 70% Black, 30% Black Dot. Sites showing little LS on down slope and LS at the top. 2005 P4 - 025, P5 - 001, 002. GPS2 WP325.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 128 LML VIII	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**3**		10				
Monitored in 2003	**3 to 8**		5	33			
Monitored in 2004	**2**		5	41			
Monitored in 2005	**3 to 5**		4	46			

Mostly black beetles released on 22 June 2001 N 50.77214 W 104.87707

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508668 M 5624274. 2002: Top hill, facing east. Photo 2002 P5 - 006. 2003: Black 50% and Black - Brown Dot 50%. Site photo. 2003 P5 - 009. 2004: 80% Black - 20% Black Dot. 2004 P5 - 024, 025. 2005 P4 - 024. GPS2 WP326.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 129 IX	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2002	1		5				

Mostly black beetles released on 22 June 2001 N 50.77080 W 104.87582

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508757 M 5624126. 2002: Photo 2002 P7 - 014, 015. Black established. Site is an opening in the woods, the next open site to the north had 4/sweep (50% Black and 50% Black Dot). GPS2 WP327.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 030 LML X	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2003	3		1	68			

Mostly black beetles released on 22 June 2001 N 50.77142 W 104.87542

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508785 M 5624195. 2002: Could not find the site, GPS reading is a heavy shrub-wood area. 2003: Black 100%. Back of site photo, and site photos. 2003 P6 - 008, 009. GPS2 WP328.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 031 XI	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1 to 2**		10				
Monitored in 2003	**15 to 18**		7	51			
Monitored in 2004	**12**		0	33			
Monitored in 2005	**3 to 4**		4	43			

Mostly black beetles released on 22 June 2001 N 50.77259 W 104.87810

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508596 M 5624324. 2002: Photo 2002 P5 - 009. 1st patch and 2nd patch are Black, 3rd patch are Black Dot. 2003: Black 60%, Black dot 40%. Site photo. 2003 P5 - 006. 2004: Black. 2004 P5 - 022. 2005: 100% Black. Sweep net at GPS0, photographic at site, nearest patch. 2005 P4 - 021, 022. GPS2 WP329.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 121 LML I	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2002	**4 to 6**		5				
Monitored 2003	**20 - 25**		6	53			
Monitored 2004	**3**		1	36			
Monitored 2005	**3 to 5**		6	48			

Mostly black beetles released on 22 June 2001 N 50.77408 W 104.87733

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508650 M 5624490. 2002: Release area. Photo 2002 P5 - 014. 2003: Black 100%. Site photo and next patch (25/sw). 2003 P5 - 016, 017. 2004: Black. 2004 P6 - 006, 007. 2005: 100% Black. 2005 P5 - 007. GPS2 WP330.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 122 LML II	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2002	**11**		5				
Monitored 2003	**13 to 18**		4	58			
Monitored 2004	**1 to 2**		5	46			
Monitored 2005	**2 to 5**		3	53			

Mostly black beetles released on 22 June 2001 N 50.77443 W 104.87770

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508624 M 5624530. 2002: Release site. Photo 2002 P5 - 012. Top of hill. 2003: 20/sw in leafy spurge by brush. 2003: Black 100%. Site photo. 2003 P5 - 018. 2004: 2004 P6 - 014, 015. 2005: 100% Black. 2005 P5 - 008. GPS2 WP331.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 123 LML III	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**<1**		8				
Monitored in 2003	**2 to 11**		10	41			
Monitored in 2004	**2 to 3**		6	41			
Monitored in 2005	**3**		13	48			

Mostly black beetles released on 22 June 2001 N 50.77447 W 104.87818

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508589 M 5624534. 2002: Release site. Photo 2002 P4 - 011. Black and Black Dot. Lots of ants. 2003: Black 95%. Site with lots of flowers (7/sw). Site photo and, patch before and in background. 2003 P5 - 019, 020. 2004: 60% Black, 40% Black Dot. 2004 P6 - 011, 012, 013. 2005: 100% Black. Western snowberry with leafy spurge. 2005 P5 - 006. GPS2 WP332.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 124 LML IV	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2002	**3**		6				
Monitored 2003	**3 to 9**		6	43			
Monitored 2004	**4**		8	41			
Monitored 2005	**3 to 4**		8	41			

Mostly black beetles released on 22 June 2001 N 50.77395 W 104.87911

Comments: 2001: 4000 beetles released at Last Mountain House Provincial Park. UTM = U 0508524 M 5624478. 2002: Release area. Photo 2002 P5 - 010. 90% Black. 2003: Black 95%. 2003: Site photo. 2003 P5 - 005. 2004: 2004 P6 - 010. 2005: 100% Black. 2005 P5 - 005. GPS2 WP333.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE Kelvin Kelly 778-8496

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 9	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**3**		15				
Monitored in 2003	**10 to 12**		10	43			
Monitored in 2004	**3 to 12**		15	46			

Mostly black beetles released on July 10, 2000 N 50.77413 W 104.87792

Comments: 2000: On west side of creek, on top of hill next to 1st solid white stake. 2002: Release area, Black on right, Black Dot on left. Photo 2002 P5 - 013. 2003: Black 95%. Site photo, area on west side, area on north side (3 photos). 2003 P5 - 021, 022, 023, 024, 025. 2004: 12/sw in the patch in the photo. 2004 P6 - 008, 009. GPS2 WP317.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 12	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1**		4				
Monitored in 2003	**3 to 8**		4				
Monitored in 2004	**2 to 4**		6	36			
Monitored in 2005	**3 to 4**		6	36			

Mostly black beetles released on July 10, 2000 N 50.77222 W 104.87748

Comments: 2000: Top of hill, on west side of creek on east side of plateau. 2002: Release site. Photo 2002 P5 - 007, 008 (Hawk moth). 2003: Black 50% Black Dot 50%. Site photo and patch before and in background of site. 2003 P5 - 007, 008. 2004: 80% Black - 20% Black Dot. 2004 P5 - 023. 2005: 90% Black, 10% Black Dot. Thin leafy spurge in 15 m circle. 2005 P4 - 023. GPS2 WP318.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE

RM 219 Longlaketon NW 8-21-22 W2 SCWW wpt 18	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**10 to 25**		3				

Mostly black beetles released on July 10, 2000 N 50.77168 W 104.87583

Comments: 2000: 1250 beetles released. Down slope from wpt 12, on west side of creek. 2002: Release site, east facing. Photo 2002 P5 - 005. Mostly black dot, 5% black. GPS2 WP319.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE

RM 219 Longlaketon NE 8-21-22 W2 SCWW wpt 23	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1**		7				
Monitored in 2003	**1 to 2**		7	30			
Monitored in 2004	**3**		5	43			
Monitored in 2005	**2 to 3**		11	43			

Mostly black beetles released on July 10, 2000 N 50.77028 W 104.87320

Comments: 2000: Release site. Photo 2002 P7 - 013. 2500 beetles released. On east side of creek where original camp was planned. 2003: Black 60% and Black - Brown Dot 40%. East top of hill. Site photo (site beyond patch 3/sw). 2003 P6 - 007. 2004: 95% Black, 5% Black Dot. 2004 P6 - 016, 017. 2005: 80% Black, 20% Black Dot. Site and closeup. 2005 P5 - 015, 016. GPS2 WP320.

Contact Person: J. Oliver 535-9760 SWA; Landowner: SE

RM 219 Longlaketon NW 18-21-21 W2 SK-C-89-0002	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>20**	25 x 85	40	50			5
Monitored in 2000	**5 to 15**	600	5 to 20				
Monitored in 2002	**8**		8				
Monitored in 2003	**5 to 20**		10	36			
Monitored in 2004	**4 to 10**		7	51			
Monitored in 2005	**3 to 5**		9	36			

Brown Dot Beetle Release at Kannata Valley in 1989. N 50.79951 W 104.91324

Comments: 1995: Excellent site. Approximately 12 collections made. 1999: Phone survey. Beetles present. 2000: Good control on the warm side of the hill but beetles are not moving within 30' of water. 2002: Photo 2002 P5 - 016. 6/sweep in dense leafy spurge, control good down to a point near the water, in area near the water 1 Black Dot/sweep. 2003: Black Dot 100% Site photo. 2003 P6 - 014. 2004: Black Dot. 2004 P8 - 001, 002, 003, 004, 005, 006, 007, 008. 2005: 100% Black Dot. Site, closeup, area, area. 2005 P9 - 014, 015, 016, 017. GPS1 WP063.

Contact Person: Mike Mihal 731-3286 or John Mihal 731-2353

RM 219 Longlaketon NE 8-21-21 W2 SK-N-90-0062	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**5**	40 x 5	40	50	65.8	18.2	10
Monitored in 2000	**1 to 2**		5				
Monitored in 2002	**5 to 15**						
Monitored in 2003	**6 to 16**		11	48			
Monitored in 2004	**1, 0 to 4, 3 to 7, 2 to 5**		3	51			
Monitored in 2005	2/sw, 6/sw hill		12	30			

Black Dot Beetle Release in 1990 at Last Mountain House Park. N 50.77493 W 104.87224

Comments: 1995: Site is doing fair. Site has declined slightly since 1994. Beetles have spread north to patch on adjacent hill. In 1998, beetles were >20 per sweep. 1999: Phone survey. Not many beetles, little leafy spurge stand reduction. 2000: Site was grazed by 800 sheep for 24 days in 2000, starting on July 26. 2002: Sample site 5/sw, 15/sw. Photo 2002 P4 - 021, 022. Top of hill to the right Black Dot. 2003: 1st sample 6/sw, 2ond sample 7 - 16/sw. Black 95%. Photo 2003 P4 - 003. Photos area, site, patch before site (example of a collection area). 2003 P6 - 001, 002, 003. 2004: Cover of leafy spurge was reduced. 90% Black, 10% Black Dot. 2004 P4 - 022, P5 - 007, 008, 020, P6 - 020. 2005: 80% Black Dot, ,20% Black,90% Black on the hill. Good stand of sweet clover. 2005 P5 - 006, 007. GPS1 WP068.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 219 Longlaketon NE 8-21-21 W2 SK-C-90-0017	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>20**	unlimited	35	40	53.2	22.8	10
Monitored in 2000	**1**						
Monitored in 2002							

Brown Dot Beetle Release in 1990 at Last Mountain House Park. N 50.77493 W 104.87224

Comments: 1995: Site is doing well. Can be harvested in 1996. In 1998, beetles were >20 per sweep. 1999: Phone survey. Not many beetles, little leafy spurge stand reduction. 2000: Site was grazed by 800 sheep for 24 days in 2000, starting on July 26. The site is to the west of SK-N-90-0062, down the hill. It has no spurge, a good stand of grass, beetles did a good job. GPS1 WP068?.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 219 Last Mountain House NE 8-21-21 W2 AC-96-001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**0**		0				
Monitored in 2002	**>1**		0				
Monitored in 2003	**0**		0	0			
Monitored in 2004	**0**		0	0			
Monitored in 2005	**0**		0	0			

Brown Dot released in 1996. N 50.77506 W 104.87371

Comments: Nearest City: Craven. 2000: Site was grazed by 800 sheep for 24 days in 2000, starting on July 26. Could only find 3 small leafy spurge plants, a good grass stand. Assume beetles damage on a south facing slope. 2002: Release site, across creek 2-3 blacks/sw, closer to creek. Photo 2002 P5 - 023, 024, 025. Leafy spurge is controlled. 2003: West side of creek. Site, across creek, near creek, area. 2003 P6 - 010, 011, 012, 013. 2004: 2004 P5 - 021. 2005: Site, area and path up the hill. 2005 P5 - 009, 010, 011. GPS1 WP069.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 219 Last Mountain House NE 8-21-21 W2 AC-96-002	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**1**		0				
Monitored in 2002	**5 to 6**		10				
Monitored in 2003	**7 and 30 - 35**		6	51			
Monitored in 2004	**0, 4**		<1	25			
Monitored in 2005	**1**		2	58			

Brown Dot released in 1996. N 50.77416 W 104.87321

Comments: Nearest City: Craven. 2000: Sheep did most of the damage on leafy spurge. Site was grazed by 800 sheep for 24 days in 2000, starting on July 26. 2002: Release site. Photo 2002 P5 - 001. 2003: Black 100%. Site photo 2003 P4 - 004, P6 - 004. 2004: Leafy spurge reduced. 2004 P4 - 023, P5 - 005, 006, P6 - 019. 2005: 90% Black, 10% Black Dot. 2005 P3 - 007. GPS1 WP070.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 219 Last Mountain House NE 8-21-21 W2 AC-96-003	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**0**						
Monitored in 2002	**0**		0				
Monitored in 2003	**0**		0	0			
Monitored in 2004	**1, 3, 1**		<1	41			
Monitored in 2005	**0**		<1	41			

Brown Dot released in 1996. N 50.77299 W 104.87368

Comments: Nearest City: Craven. 2000: Site was grazed by 800 sheep for 24 days in 2000, starting on July 26. Could not find any large leafy spurge plants, found 3 brown dots on general sweeps, upon further inspection found 2 small plants, 2-3 in. tall. 2002: Release site, west facing. Photo 2002 P5 - 003, 004. Leafy spurge controlled. 2003: East side of valley. Site photo. 2003 P4 - 006, 007, P6 - 006. 2004: Leafy spurge returned, set seed. 2004 P4 - 025, P5 - 001, 002, P6 - 018. 2005: 2005 P6 - 013. GPS1 WP071.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 219 Last Mountain House NE 8-21-21 W2 AC-96-004	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**1**		0				
Monitored in 2002	**3 to 4**		20				
Monitored in 2003	**6 and 15 - 16**		10	46			
Monitored in 2004	**0, 1 to 4, 2 to 3**		7	41			
Monitored in 2005	**1**		1	43			

Brown Dot released in 1996. N 50.77330 W 104.87335

Comments: Nearest City: Craven. 2000: Large spurge plants had their leaves stripped by sheep. Site was grazed by 800 sheep for 24 days in 2000, starting on July 26. 2002: Release area. Photo 2002 P5 - 002. 5 to 10% black. 2003: Black 90% and Black - Brown Dot 10%. Site photo. 2003 P4 - 005, P6 - 005. 2004: 95% Black, 5% Black Dot. 2004 P4 - 024. 2005: 100% Black. 2005 P3 - 008. GPS1 WP072.

Contact Person: Rocky Coleman 787-1040; Landowner: SE

RM 219 Last Mountain House NW 18-21-21 W2 Number ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Mostly Black and some Brown Dot released in 2000. N 50.7861 W 104.9029

Comments: 2000: 2500 beetles released on July 6.

Contact Person: Clark Brenzil 787-4673; Sam Small 731-2740

RM 220 McKillop NW 24-21-22 W2 Rapp3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

1000 released on July 15, 2003 N 50.8043 W 104.9319 Cal

Comments:

Contact Person: Landowner: Ron Martin 731-3248

RM 220 McKillop NW 33-21-22 W2 SCWW wpt 58	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2005	**0**		0	0			

Mostly black beetles released on August 8, 2000 N 50.83127 W 104.99358

Comments: 2000: West of house, along fenceline. Nearest town: Regina Beach. 2005: Field, wrong GPS coordinates. GPS2 WP321.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Morley Alexander

RM 220 McKillop NW 33-21-22 W2 SCWW wpt 57	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored 2005	**0**		0	0			

Mostly black beetles released on August 8, 2000 N 50.83160 W 104.99498

Comments: 2000: In hay field, west of house. Nearest town: Regina Beach. 2005: Field, wrong GPS coordinates. GPS2 WP322.

Contact Person: J. Oliver 535-9760 SWA; Landowner: Morley Alexander

RM 220 McKillop SK. Beach Lot5Bl.1 SK-C-88-0001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**10**	unlimited	20	50			10

Brown Dot Beetle Release at Sask. Beach in 1988. N 50.8006 W 104.9491

Comments: 1995: Spurge reduced and beetles have moved from the original release area. Beetles numbers are not high but they have located throughout area. 1999: Phone survey. Number unknown, leafy spurge stand is reduced.

Contact Person: Alec Ferris 586-2828

RM 220 McKillop SE 27-21-22 W2 SK-N-88-0014	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**50 to 60**	180 x 310	45	45			10
Monitored in 2000	**2 to 12**		2				
Monitored in 2002	**7 to 11**		10				
Monitored in 2003	**3 to 11**		20	58			
Monitored in 2004	**1 to 2**		20	41			
Monitored in 2005	**1 to 7**		9	41			

Black Dot Beetle Release in 1988. N 50.80553 W 104.96861

Comments: 1995: Unable to check site in 1995 due to weather conditions, site was previously doing well. 1999: Phone survey. In 1997, beetles present but not plentiful. Minimal damage. 2000: A south facing slope. Very little leafy spurge in the area. When present leafy spurge is in the wetter areas or in woody brush cover. 2002: Photo 2002 P5 - 018. Beetle were found on the edge of the patch. 2003: Site photo (3/sw) and before site (11/sw). 2003 P6 - 016, 017. 2004: Black Dot. 2004 P7 - 018. 2005: 100% Black Dot. Area, site, closeup 1/sw at brush, 7 /sw in thinned out area. 2005 P9 - 001, 002, 003. GPS1 WP056.

Contact Person: Russell Flavel 731-2985

RM 220 McKillop SE 27-21-22 W2 SK-C-89-0001	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**1 to 3**	20 x 40	30	55	51	20.5	5
Monitored in 2000	**5**		5				
Monitored in 2002	**3 to 14**		6				
Monitored in 2003	**1 to 2**		5	56			
Monitored in 2004	**1 to 2**		5	66			
Monitored in 2005	**1**		8	53			

Brown Dot Beetle Release in 1989. N 50.80611 W 104.96874

Comments: 1995: Unable to check site in 1995 due to poor weather conditions, site was doing OK previously. 1999: Phone survey. In 1997, beetles present but not plentiful. Minimal damage. 2000: A north facing slope. Leafy spurge is reduced on the north facing slope of the hill but leafy spurge is in the brush. 2002: Release area, 3/sw right of trees, 14/sw in front of photo. Photo 2002 P5 - 019. 2003: Site, by brush, 5 area photos. 2003 P6 - 019, 020, 021, 022 (vigorous growing leafy spurge), 023, 024. 2004: Black Dot. 2004 P7 - 019, 020, 021. 2005: 100% Black Dot. Site, closeup, area. 2005 P9 - 006, 007, 008. GPS1 WP058.

Contact Person: Russell Flavel 731-2985

RM 220 McKillop SE 27-21-22 W2 SK-C-90-0020	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**1 to 10**	10 x 40	75	55	58.9	18.6	10
Monitored in 2000	**2 to 5**	several ac	4				
Monitored in 2002	**4 to 7**		4				
Monitored in 2003	**2 to 3**		8	48			
Monitored in 2004	**2 to 4**		12	46			
Monitored in 2005	**4 to 7**		6	43			

Brown Dot Beetle Release in 1990. N 50.80103 W 104.95330

Comments: 1995: Unable to check site due to poor weather conditions; site was questionable in 1994. 1999: Phone survey. In 1997, beetles present but not plentiful. Minimal damage. 2000: Leafy spurge reduced to a low level, beetles are still moving out from the original site. 2002: 7/sw near top of photo to right. Photo 2002 P5 - 017. 2003: Site photo 2003 P6 - 015. 2004: Over night rain, grass wet. Black Dot. 2004 P7 - 017. 2005: 100% Black Dot. Site, closeup, area, area. 2005 P8 - 023, 024, 025, 026. GPS1 WP055.

Contact Person: Russell Flavel 731-2985

RM 220 McKillop NW 23-21-22 W2 SK-C-91-0018	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**5 to 60**	55 x 400	45	50	55.7	17.9	5
Monitored in 2002	**2**		<1				
Monitored in 2003	**1**		1	46			
Monitored in 2004	**1**		5	41			
Monitored in 2005	**8**		8	38			

Brown Dot Beetle Release in 1991. N 50.980601 W 104.96894

Comments: 1995: Unable to check site due to poor weather conditions, site was considered excellent in 1994 with collections being made. 1999: Phone survey. In 1997, beetles present but not plentiful. Minimal damage. 2002: Release area, don't know if beetles controlled beetles on hill top, east view, valley to north. Photo 2002 P5 - 020, 021. 2003: Site photo. 2003 P6 - 018. 2004: Black Dot. 2004 P7 - 022, 023, 024, 025. 2005: 100% Black Dot. Site, closeup. 2005 P9 - 004, 005. GPS1 WP059.

Contact Person: Russell Flavel 731-2985

RM 222 Craik NE 15-21-28 W2 SK-C-91-0006	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**10**	unlimited	40	45	63.4	15.9	5
Monitored in 1999	**2**		0	60	63.4	15.9	5

Brown Dot Beetle Release in 1991. N 50.78825 W 105.80072

Comments: 1995: Beetles found throughout area. Spurge is declining. 1999: Lots of beetles and leafy spurge vigour is reduced. Beetles are moving. GPS1 WP018.

Contact Person: Doug Patience 638-4967

RM 222 Craik NE 15-21-28 W2 SK-C-92-0017	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**10**	unlimited	25	35			5
Monitored in 1999	**20**		3	60			

Brown Dot Beetle Release in 1992. N 50.78800 W 105.80061

Comments: 1995: Beetles found throughout area. Spurge is declining. 1999: Lots of beetles and leafy spurge vigour is reduced. Beetles are moving. GPS1 WP029.

Contact Person: Doug Patience 638-4967

RM 222 Craik NW 14-24-29 W2 Black Rel 1998	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1999	**2**	6	6	60			
Monitored in 2003	**3**		0	0			
Monitored in 2004	**5**		5	61			
Monitored in 2005	**3 to 4**		12	56			

Black Beetle released in 1998. N 51.04992 W 105.95052

Comments: Nearest town; Craik. 2003: Good LS control with goats. Black Dot, a few Blacks. Site photos. 2003 P10 - 017, 018. 2004: Black. No goat grazing in 2004. 2004 P - 001, 002, 003, 004. 2005: 95% Black, 5% Black Dot. Area, area, site, closeup. 2005 P12 - 001, 002, 003, 004. GPS1 WP030.

Contact Person: Doug Patience 638-4967; Landowner: Gerald Muirhead

RM 223 Huron SE 3-24-2 W3 Patience US1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**30**		15				
Monitored in 2003	**7 to 16**		6	43			
Monitored in 2004	**9**		9	56			
Monitored in 2005	**3 to 4**		10	56			

Mostly Black, some Black Dot released in 2001. N 51.01098 W 106.19580

Comments: 2002: Release site. Photo 2002 P6 - 016. Black Dot and a few Black established. 2003: Thinning out around release point. Black Dot. Site photo. 2003 P10 - 007. 2004: Black Dot. 2004 P18 - 016. 2005: 100% Black Dot. Site. 2005 P12 - 009. GPS2 WP341.

Contact Person: Doug Patience 638-4967; Landowner: Dale Coutts 759-2516

RM 223 Huron SE 3-24-2 W3 Patience US2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**15**		45				
Monitored in 2003	**4 to 6**		6	38			
Monitored in 2004	**10**		7	38			
Monitored in 2005	**9 to 10**		16	58			

Mostly Black, some Black Dot released in 2001.	N 51.01101	W 106.19606

Comments: 2002: Release site. Photo 2002 P6 - 015. Black Dot and a few Black established. 2003: Center of site thinning out. Black Dot. Site photo. 2003 P10 - 008. 2004: Black Dot. 2004 P18 - 017. 2005: Site. 2005 P12 - 010. GPS2 WP342.

Contact Person: Doug Patience 638-4967; Landowner: Dale Coutts 759-2516

RM 223 Huron SE 3-24-2 W3 Patience US3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**35**		15				
Monitored in 2003	**12**		9	48			
Monitored in 2004	**7**		18	46			
Monitored in 2005	**3 to 6**		19	58			

Mostly Black, some Black Dot released in 2001.	N 51.01067	W 106.19571

Comments: 2002: Release site. Photo 2002 P6 - 014. Black Dot and a few Black established. 2003: Site thinned out. Black Dot. Site photo. 2003 P1 - 006. 2004: Black Dot. 2004 P18 - 013, 014, 015. 2005: 100% Black Dot. Site. 2005 P12 - 007. GPS2 WP343.

Contact Person: Doug Patience 638-4967; Landowner: Dale Coutts 759-2516

RM 223 Huron SE 3-24-2 W3 Patience US4	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**25**		25				
Monitored in 2003	**18 to 19**		12	36			
Monitored in 2004	**7**		6	43			
Monitored in 2005	**3 to 4**		25	58			

Mostly Black, some Black Dot released in 2001. N 51.01073 W 106.19624

Comments: 2002: Release site. Photo 2002 P6 - 013. Black Dot and a few Black established. 2003: Black Dot. Site photo. 2003 P10 - 009. Black Dot. 2004 P18 - 018. 2005: 5% Black, 95% Black Dot. Site. 2005 P12 - 008. GPS2 WP344.

Contact Person: Doug Patience 638-4967; Landowner: Dale Coutts 759-2516

RM 223 Huron SE 3-24-2 W3 Patience US5	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**15**		16				
Monitored in 2003	**4 to 7**		7	46			
Monitored in 2004	**5**		7	43			
Monitored in 2005	**3**		15	64			

Mostly Black, some Black Dot released in 2001. N 51.01074 W 106.19707

Comments: 2002: Release site. Photo 2002 P6 - 012. Black Dot and a few Black established. 2003: Black Dot, a few Black. Site photos. 2003 P10 - 010, 011. 2004: Black Dot. 2004 P18 - 020. 2005: 100% Black Dot. Site. 2005 P12 - 012. GPS2 WP345.

Contact Person: Doug Patience 638-4967; Landowner: Dale Coutts 759-2516

RM 223 Huron SE 3-24-2 W3 Patience US6	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**20**		20				
Monitored in 2003	**5 to 7**		3	38			
Monitored in 2004	**3**		6	43			
Monitored in 2005	**5 to 7**		13	61			

Mostly Black, some Black Dot released in 2001. N 51.01079 W 106.19702

Comments: 2002: Release site. Photo 2002 P6 - 011. 75% Black Dot and 25% Black established. 2003: Black Dot, a few Black. Site photo. 2003 P10 - 012. 2004: Black Dot, 1 Black. 2004 P18 - 019. 2005: 100% Black Dot. Site. 2005 P12 - 011. GPS2 WP346.

Contact Person: Doug Patience 638-4967; Landowner: Dale Coutts 759-2516

RM 223 Huron SE 3-24-2 W3 Patience US7	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**20**		15				
Monitored in 2003	**9**		12	56			
Monitored in 2004	**5**		24	48			
Monitored in 2005	**1 to 2**		10	58			

Mostly Black, some Black Dot released in 2001. N 51.01077 W 106.19745

Comments: 2002: Release site. Photo 2002 P6 - 010. Black Dot and a few Black established. 2003: Black Dot, a few Black. Site photo. 2003 P10 - 013. 2004: Black Dot. 2004 P18 - 021. 2005: 100% Black Dot. Site. 2005 P12 - 013. GPS2 WP347.

Contact Person: Doug Patience 638-4967; Landowner: Dale Coutts 759-2516

RM 223 Huron SE 3-24-2 W3 Patience US8	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**20**		9				
Monitored in 2003	**8 to 21**		8	51			
Monitored in 2004	**8 to 10**		12	46			
Monitored in 2005	**3 to 5**		15	51			

Mostly Black, some Black Dot released in 2001. N 51.01076 W 106.19773

Comments: 2002: Release site. Photo 2002 P6 - 009. Black Dot established. Some Black Beetles were found in a depression to the northeast. 2003: No woody plants in the 8 release sites. Black Dot, a few Black. Site photo, west, east, northwest. 2003 P10 - 014, 015, 016. 2004: Black Dot. 2004 P18 - 022, 023, 024, 025. 2005: 100% Black Dot. Site. 2005 P12 - 014. GPS2 WP348.

Contact Person: Doug Patience 638-4967; Landowner: Dale Coutts 759-2516

RM 223 Huron SE 3-24-2 W3 Number	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Black beetles released on July 9, 2001 N 51.0115 W 106.1919

Comments: There was a major release (48,000) to the north by Doug Patience during June 2001.

Contact Person: Dale Weisbrot 567-4400; Landowner: Dale Coutts 759-2516

RM 223 Huron NW 33-23-3 W3 SK-N-88-0011	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**3 to 5**	unlimited	30	40	94.2	3	10
Monitored in 2001	**1**		50	60			
Monitored in 2005	**2 to 10**		6	48			

Black dot release in 1988. N 50.99764 W 106.36691

Comments: 1995: Site doing well. Beetle numbers have slightly increased, and have spread extremely far. Beetles collected from this site in 1998. 1999: Phone survey. Lots of beetles and leafy spurge is reduced. 2001: Ants were found at the release site but not through the tress and up the hill. 3 beetles/sweep were found through the trees and up the hill. 2005: 100% Black Dot. Site, closeup. 2005 P11 - 022, 023. GPS1 WP137.

Contact Person: Reg Dolman 759-2398

RM 223 Huron SW 33-23-3 W3 SK-N-89-0011	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**3 to 5**	unlimited	30	50			
Monitored in 2001	**2**	10	50				
Monitored in 2005	**5 to 7**		6	51			

Black Dot Beetle Release in 1989. N 50.99696 W 106.36807

Comments: Beetles have moved over the hill and are doing well. Six collections made. Beetles collected from this site in 1998. 1999: Phone survey. Lots of beetles and leafy spurge is reduced. 2001: Leafy spurge is thinned, but some plant have set seed. 2005: 100% Black Dot. Site, area, closeup, area. 2005 P11 - 018, 019, 020, 021. GPS1 WP136.

Contact Person: Reg Dolman 759-2398

RM 223 Huron SE 3-24-2 W3 SK-N-89-0012	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**4 to 6**	3 x 5	65	75	94.5	3.8	
Monitored in 2001	**0**						
Monitored in 2004	**1**			46 to 66			
Monitored in 2005	**1 to 5**		12	41			

Black Dot Beetle Release in 1989. N 51.0115 W 106.1919

Comments: 1995: Spurge still quite dense however beetles were found predominantly southwest of the stake. 2001: Monitored by D. Patience. 2004: Black Dot. Rapid leafy spurge spread in the last 5 years. 2004 P18 - 006, 007, 008, 009, 010, 011, 012. 2005: 100% Black Dot. Site 1/sw, 5/sw, 3/sw; site 5/sw, 1/sw. 2005 P12 - 005, 006. GPS1 WP225.

Contact Person: Dale Coutts 759-2516

RM 223 Huron SE 33-24-3 W3 SK-C-90-0028	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**3 to 5**	unlimited	50	55	65.5	18	
Monitored in 2001	**3 to 5**		25	70			
Monitored in 2005	**5 to 6**		8	51			

Brown Dot Beetle Release in 1990. N 50.99796 W 106.36446

Comments: 1995: Site doing fair. Site may be merging with 1988 Black Dot release. 1999: Phone survey. Lots of beetles and leafy spurge is reduced. 2001: Leafy spurge is thinned out but some plants flowered. 2005: 100% Black Dot. Site, closeup, site. 2005 P11 - 015, 016, 017. GPS1 WP135.

Contact Person: Reg Dolman 759-2398

RM 223 Huron SE 34-22-3 W3 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**3**		25	53			
Monitored in 2003	**1 to 3**		6	51			

Black Beetle released in 1998. N 50.91615 W 106.32451

Comments: Nearest town; Tugaske. 2001: Released by Reg Dolman, could not located the release point. 2003: Black Dot, a few Black. Beetles on the perimeter of the patch. Site photo. 2003 P10 - 005. GPS1 WP132.

Contact Person: Reg Dolman 759-2398; Landowner: Reg Dolman

RM 223 Huron SW 22-23-3 W3 1991-92 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**1 to 2**		20	55			
Monitored in 2005	**5 to 20**		12	30			

Br Dot Beetle released in 1991 or 1992. N 50.99534 W 106.36211

Comments: Nearest town; Tugaske. 2001: One of the original release sites. 2005: 100% Black Dot. 5/sw northern slope, 20/sw southern slope. 2005 P11 - 012, 013, 014. GPS1 WP163.

Contact Person: Reg Dolman 759-2398; Landowner: Reg Dolman

RM 223 Huron NW 22-23-3 W3 96 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**5**		20	60			
Monitored in 2005	**1**		30	58			

Black Beetle released in 1996. N 50.97559 W 106.34700

Comments: Nearest town; Tugaske. 2001: 90% Black and 10% Br Dot. 2005: 75% Black, 25% Black Dot. Site. 2005 P11 - 024. GPS1 WP133.

Contact Person: Reg Dolman 759-2398; Landowner: Reg Dolman

RM 223 Huron NE 28-23-3 W3 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**5**		20	50			
Monitored in 2005	**2 to 4**		9	58			

Black Beetle released in 1998. N 50.98771 W 106.35699

Comments: Nearest town; Tugaske. 2001: On the ridge from the road up from the valley. Reduced density, many shoots have seed heads. 2005: 100% Black. 2005 P11 - 010, 011. GPS1 WP134.

Contact Person: Reg Dolman 759-2398; Landowner: Reg Dolman

RM 223 Huron SE 34-23-3 W3 1996-98 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**2**		30	55			

Black Beetle released in 1996 or 1998. N 50.99873 W 106.32683

Comments: 2001: Some thinned out. GPS1 WP164.

Contact Person: Reg Dolman 759-2398; Landowner: Reg Dolman

RM 223 Huron SW 34-22-3 W3 ?	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**1**		35	40			
Monitored in 2005	**1**		7	36			

Black Beetle released in 1998. N 50.91615 W 106.32451

Comments: Nearest town; Tugaske. 2001: Site has 70% black and 30% Br Dot. Thin out leafy spurge but some leafy spurge has seed heads. In 2001, a collection was made from this site. 2005: 50% Black, 50% Black Dot. Site, western snowberry present. 2005 P11 - 025. GPS1 WP132.

Contact Person: Landowner: Denis Brown

RM 231 Livingston NW 27-21-28 W3 Number	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Mix of Black and Brown Dot released in 2000. N 50.8152 W 109.8033

Comments: 2000: 200 released on August 18.

Contact Person: Ed Gramlich 679-2339; Landowner: Brian Ourmus at Leader

RM 232 Deer Forks NW 28-20-29 W3 Number	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

Mix of Black and Brown Dot released in 2000. N 50.7278 W 109.9648

Comments: 2000: 200 released on August 18.

Contact Person: Ed Gramlich 679-2339; Landowner: Darren and Dean Mertes

RM 247 Kellross SE 16-26-14 W2 SK-C-92-0004	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**1 to 2**	2 x 4	55	65			

Brown Dot Beetle Release in 1992. N 51.2153 W 103.8898

Comments: Site not doing well likely due to presence of brush in area. 1999: Phone survey. site has not been visited for several years.

Contact Person: Robert Jorgensen 675-4423

RM 261 Chesterfield NW 14-24-29 W3 Number	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in ????							

500 black beetles released on July 11, 2001. N 51.0479 W 109.9482

Comments: Released 7 km west of Glen's ___ Vac Service, just east of main valley on Creek.

Contact Person: Richard Wharton 567-4406; Landowner: Gerald Muirhead 734-5100

RM 279 Mount Hope SW 22-28-20 W2 SK-N-88-0007	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	5	5 x 5	45	50	80.5	11.5	

Black Dot Beetle Release in 1988. N 51.4044 W 104.7361

Comments: 13 collections were made from this site in 1994 and there was not allot of leafy spurge present. 1995: Moist conditions from a previous nights' rain may have been a contributing factor to the low beetle count. Spurge appeared to have thinned in areas which may be attributed to beetle activity. No collections were made in 1995.

Contact Person: Unable to contact Jim Down 524-2055

RM 344 Corman Park SW 2-36-6 W3 Mooney US1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**7 to 9**		2				
Monitored in 2003	**0**		0	0			
Monitored in 2004	**0**						
Monitored in 2005	**0**						

6000 Black Beetles released on June 22, 2001 N 52.05693 W 106.75735

Comments: 2002: Release site. Photo 2002 P4 - 012. 2003: Site sprayed with a herbicide. Black Dot. Site photo. 2003 P10 - 021. 2004: Site destroyed, road and house construction. 1 - 2/sw to the east, 1/sw west, 4/sw around aspen to the west in open area facing south. 2004 P12 - 022, 023 (leafy spurge roots inn soil). 2005: Site destroyed, land levelled for construction, beetles on leafy spurge at the edge of the site. GPS1 WP123.

Contact Person: Garry Bowes, 933-7695, Neil Mooney 221-4013

RM 344 Corman Park SW 2-36-6 W3 Mooney US2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**8 to 13**		5				
Monitored in 2003	**0 to 10**		1	30			
Monitored in 2004	**0**						
Monitored in 2005	**0**						

6000 Black Beetles released on June 22, 2001 N 52.05708 W 106.75740

Comments: 2002: Release site. Photo 2002 P4 - 013. Mostly black dots established. 2003: Beetles moved inside fence. 0/sw outside fence, 10/sw inside fence, 5 to 8/sw east by trees. Black Dot, a few Black. Site photo. 2003 P10 - 020. 2004: Site destroyed, road and house construction. Site destroyed, land levelled for construction, beetles on leafy spurge at the edge of the site. GPS1 WP124.

Contact Person: Garry Bowes 933-7695, Neil Mooney 221-4013

RM 344 Corman Park SW 2-36-6 W3 Mooney US3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1 to 2**		16				
Monitored in 2003	**1**		0	13			
Monitored in 2004	**0**						
Monitored in 2005	**0**						

6000 Black Beetles released on June 22, 2001 N 52.05702 W 106.75764

Comments: 2002: Release site. Photo 2002 P4 - 011. Black dot established. 2003: Site mowed in early July. Black Dot. Site photo. Beetles on leafy spurge along the fence. Ants. 2003 P3 - 003, P10 - 019. 2004: Site destroyed, road and house construction. Site destroyed, land levelled for construction, beetles on leafy spurge at the edge of the site. GPS1 WP125.

Contact Person: Garry Bowes 933-7695, Neil Mooney 221-4013

RM 344 Corman Park SW 2-36-6 W3 Mooney US4	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**4 to 6**		12				
Monitored in 2003	**2 to 4**		0 to 4	10 to 28			
Monitored in 2004	**0**						
Monitored in 2005	**0**						

6000 Black Beetles released on June 22, 2001 N 52.05723 W 106.75776

Comments: 2002: Release site. Photo 2002 P4 - 014. Black dot established. 2003: Site mowed. Black Dot, a few Black. Site photo (2/sw by stake, 4/sw in nearest patch). 2003 P10 - 022. 2004: Site destroyed, road and house construction. Site destroyed, land levelled for construction, beetles on leafy spurge at the edge of the site. GPS1 WP126.

Contact Person: Garry Bowes 933-7695, Neil Mooney 221-4013

RM 344 Corman Park SW 2-36-6 W3 Mooney US5	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**<1**		10				
Monitored in 2003	**1 to 2**		1	18			
Monitored in 2004	**0**						
Monitored in 2005	**0**						

6000 Black Beetles released on June 22, 2001 N 52.05737 W 106.75813

Comments: 2002: Release site. Photo 2002 P4 - 015. Black dot established. 2003: Site mowed. Black Dot. Site photo. 2003 P10 - 023. 2004: Site destroyed, road and house construction. Site destroyed, land levelled for construction, beetles on leafy spurge at the edge of the site. GPS1 WP127.

Contact Person: Garry Bowes 933-7695, Neil Mooney 221-4013

RM 344 Corman Park SW 2-36-6 W3 Mooney US6	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**>1**		9				
Monitored in 2003	**1**		1	20			
Monitored in 2004	**0**						
Monitored in 2004	**0**						

6000 Black Beetles released on June 22, 2001 N 52.05724 W 106.75820

Comments: 2002: Release site, blacks established between stake and aspen. Photo 2002 P4 - 016, 017. Black dot established. 2003: Site mowed. Black Dot. Could not find Blacks near trees. Site photo. 2003 P10 - 024. 2004: Site destroyed, road and house construction. Site destroyed, land levelled for construction, beetles on leafy spurge at the edge of the site. GPS1 WP128.

Contact Person: Garry Bowes 933-7695, Neil Mooney 221-4013

RM 344 Corman Park SW 3-36-3 W3 Mooney US7	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1 to 2**		10	31			
Monitored in 2003	1		0	13			
Monitored in 2004	1		25	48			
Monitored in 2005	1		28	74			

6000 Black Beetles released on June 22, 2001 N 52.05740 W 106.77342

Comments: 2002: Black dots are establishing and black are not. Site photo. 2002 P4 - 005. 2003: Site mowed. Black Dot. Site photo. 2003 P10 - 025. 2004: 90% Black, 10% Black Dot. 2004 P13 - 024. 2005: 95% Black, 5% Black Dot. Western snowberry present. 2005 P11 - 004, 005. GPS1 WP129.

Contact Person: Garry Bowes 933-7695, Neil Mooney 221-4013

RM 344 Corman Park SW 3-36-3 W3 Mooney US8	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1 to 2**		1 to 2	31			
Monitored in 2003	**2**		0	15			
Monitored in 2004	**1**		10	41			
Monitored in 2005	**1**		13	66			

6000 Black Beetles released on June 22, 2001 N 52.05749 W 106.77359

Comments: 2002: Site Photo, 2002 P4 - 006. Black dots are establishing and black are not. 2003: Site mowed. Black Dot. Site photos. 2003 P10 - 026, 027. 2004: Black Dot (1 Black). 2004 P13 - 025, P14 - 001 (site from fence), 002 (patch looking north), 003 (patch looking west). 2005: 80% Black, 20% Black Dot. Western snowberry present. 2005 P11 - 006, 007. GPS1 WP130.

Contact Person: Garry Bowes 933-7695, Neil Mooney 221-4013

RM 344 Corman Park SE 33-35-6 W3 SK-N-90-0058/C-91-0002	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1994	**1 to 2**	6 x 6	40	70	95.2	1.87	0
Monitored in 1999	**5**	300	50	46			
Monitored in 2000	**1 to 2**		20-30				
Monitored in 2001	**5**		12	35			
Monitored in 2002	**1 to 2**		0				
Monitored in 2003	**1**		0	15			
Monitored in 2004	**3 to 5**		1	30			
Monitored in 2005	**1**		1	33			

Black Dot Beetle Release in 1990 and Brown Dot in 1991. N 52.04812 W 106.78607

Comments: 1995: Could not locate release site in 1995. 1997: The beetles are not doing very well. 1999: Field was mowed so difficult to evaluate. Sampled a few non-mowed areas. Beetles are all over, spurge density is thinned but not to the desired density. 2000: Beetles are all over the 40ac field in low numbers. In places spurge is thinned, not grazed so a thick litter layer. 2001: Land owned by Mr. and Mrs. Thrasher. Site grazed by sheep. Leafy spurge is thinned out, but there are some seed heads on leafy spurge. 2002: Mostly black dots. Site grazed by sheep. 2003: June 13, no sheep. 2003 P1 - 007. July 15 sheep on leafy spurge. 2003 P4 - 001. August 6 sheep grazed. Black Dot. Site photo. 2003 P12 - 004. 2004: Site monitored to the east of pile, north west area filled in. Black Dot. 2004 P14 - 006. 2005: Sheep grazed. 2005 P5 - 020, 021, 022. GPS1 WP143.

Contact Person: Ed Morgan 382-0145

RM 344 Corman Park SW 34-35-6 W3 SK-C-92-0003	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**<1**	n/a	50	33			0

Brown Dot Beetle Release in 1992. N 52.0446 W 106.7794

Comments: 1995: Site not doing well. Failure could be due to excessive moisture. Site is located in an area that is not well drained. Monitored on cloudy day following heavy rains. In 1997, the beetles are not doing very well. 2001: Did not establish, housing development.

Contact Person: Ed Morgan 382-0145

RM 344 Corman Park NE 12-35-6 W3 Morgan Rel 1998	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**15**		10	40			
Monitored in 2002	**12**		1 to 4				
Monitored in 2003	**18 to 19**		6	36			
Monitored in 2004	**2 to 9**		8	56			
Monitored in 2005	**2 to 6**		13	71			

Black Beetle released in 1998. N 51.9922 W 106.7190

Comments: Nearest town; Saskatoon. 2001: A few beetles were found in the grass clearing in the bush, two ant hills between release point and clearing. Leafy spurge is thinned out, but some plants have seed heads. 2002: Site, 5/sw field edge, 12/sw grassland, 3/sw into opening. Photo 2002 P4 - 009, 010. 2003: LS growing with wolfwillow. Black, very few Black Dot. 2003 P12 - 007, 008, 009. 2004: Black. 2004 P14 - 007, 008, 009, 010. 2005: 100% Black. 3/sw on the edge and 6/sw in the clearing. 2005 P10 - 023, 024, 025. GPS1 WP045.

Contact Person: Landowner: Ed Morgan 382-0145

RM 344 Corman Park SW 4-36-6 W3 Bowes Rel 1999	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2000	**0**		20				
Monitored in 2001	**0**						
Monitored in 2002	**1 to 2**		25	36			
Monitored in 2003	**0**						
Monitored in 2004	**0**						
Monitored in 2005	**0**						

Black Beetle released in 1999 N 52.05562 W 106.80747

Comments: Released behind the old house, up the hill and over by the piece of chrome. Sandy area. 2001: Site is dune sand, leafy spurge beetles did not establish. 2002: Photo 2002 P4 - 004. No blacks but 1 to 2 black dots from an unknown population. 2003: Site destroyed, off road radio control club. Construction removed plant top growth. 2004: Site destroyed. 2005: Site destroyed, model vehicle race tract, no beetles on leafy spurge at site edges. GPS1 WP044.

Contact Person: Garry Bowes 933-7695

RM 344 Corman Park SE 33-35-6 W3 Bowes Rel 2000	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**>1**		20	40			
Monitored in 2002	**1 to 2**		0				
Monitored in 2003	**1**		0	10			
Monitored in 2004	**5**		0	15			
Monitored in 2005	**5**		0	20			

Black Beetles released in 2000. N 52.04716 W 106.78547

Comments: 2000: Land owned by Mr. And Mrs. Thrasher. In a 40 ac pasture, not grazed. 2002: Sheep grazed site with black dot beetles, not blacks established, grazed leafy spurge close up. Photo 2002 P4 - 007, 008. Blacks failed to establish, black dots had established and remain. Site grazed by sheep in 2001 and 2002. 2003: Grazed by sheep. Black Dot. Site photos. 2003 P12 - 001, 002, 003. 2004: Sheep grazed pasture. 2004 P14 - 004, 005. 2005: 5% Black, 95% Black Dot. Sheep grazed. 2005 P5 - 023, 024, 025. GPS1 WP142.

Contact Person:

RM 345 Vanscoy SE 12-35-7 W3 SK-N-91-0004	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>20**	35 x 10	25	20	94.7	2.82	10
Monitored in 1999	**10**		15				
Monitored in 2000	**5 to 7**	30	20				
Monitored in 2002	**4 to 8**		5				
Monitored in 2003	**1 to 3**		2	18			
Monitored in 2004	**2 to 4**		20 to 22	10 to 38			
Monitored in 2005	**1 to 3**		14	56			

Black Dot Beetle Release in 1991. N 51.99086 W 106.86586

Comments: 1995: Site is doing extremely well. Approximately 6 collections made. Lots of beetles near the release site, they have moved in small numbers. Leafy spurge is reduced but still at a relatively high density. 2002: Release area. Photo 2002 P4 - 018. 2003: Site mowed. Black Dot, few Blacks on North side of road. 2003 P12 - 005, 006. 2004: 90% Black Dot, 10% Black. 2004 P12 - 001 to 021. 2005: 100% Black Dot. Site, site, closeup. 2005 P11 - 001, 002, 003. GPS1 WP042.

Contact Person: Don Kinzie 668-4416

RM 406 Mayfield SW 12-41-12 W3 SK-N-90-0060	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**3**	10 x 15	20	30	70	15.2	0

Black Dot Beetle Release in 1990. N 52.5103 W 107.6013

Comments: 1995: Moderate site. Pasture heavily grazed. 1999: Phone survey. The site is fenced off and is now a sheep pasture. 2001: Site not found.

Contact Person: Richard Clayton 389-2183

RM 438 Battle River NW 19-43-16 W3 98 Release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**<1**		10	55			
Monitored in 2002	**1**		25				
Monitored in 2003	**2 to 3**		4	30			
Monitored in 2005	**1**		14	74			

Black released in 1998. N 52.71812 W 108.31214

Comments: Site located before the bridge to the right of the 3 power poles. Some leafy spurge appears to be thinned out. 2002: Release site. Photo 2002 P7 - 007, 008, 009. Site mowed, very rough for mower, mower missed. 2003: After a rain. 90% Black Dot and 10% Black. Site, close up, area (field, ROW). 2003 P12 - 015, 016, 017. 2005: 100% Black Dot. Very heavy growth of brome and leafy spurge, site, area, area with 2/sw, 50% Black and 50% Black Dot. 2005 P9 - 020, 021, 022. GPS1 WP141.

Contact Person: Bryan Doig 446-7477, Karen Benjaminson 446-4050

RM 438 Battleford SW 29-43-16 W3 Multiple Releases	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2001	**1 to 5**		1 to 8	35			
Monitored in 2002	**1 to 2**		5				
Monitored in 2003	**7**		10	51			
Monitored in 2005	**1 to 4**		16	64			

Br Dot released on ??? N 52.73181 W 108.29676

Comments: 2001: 1 to 5/sweep behind the houses, 1/sweep at the release site on the hill. The release site is thinned out. 2002: Release area Photo 2002 P7 - 005, 006. Black Dot and some Black. 2003: Top hill 70% Black Dot 30% Black, Mid 80% Black and 20% Black Dot. Site photo. 2003 P12 - 014. 2005: 5% Black, 95% Black Dot. 1/sw on hill and 4/sw between Brian's fence and trees. 2005 P9 - 018, 019. GPS1 WP140.

Contact Person: Bryan Doig 446-7477

RM 438 Prairie NE 33-42-16 W3 SK-C-92-0012	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**10**	20 x 40	40	35			

Brown Dot Beetle Release in 1992. N 52.6631 W 108.2368

Comments: Site doing fair, beetles have spread from release point and area shows insect damage. 1999: Phone survey. In 1977, the beetles were present and have thinned out the spurge. 2001: Unable to get to site.

Contact Person: Roland Radchenko 937-2704

RM 438 Battle River SW 17-43-16 W3 SK-N-88-0008	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**7 to 10**	unlimited	40	60	86	6.6	
Monitored in 2001	**1 to 2**		20	50			

Black Dot Beetle Release in 1988. N 52.69845 W 108.29646

Comments: 1995: Beetle numbers increased slightly from 1994. Beetles present throughout spurge, site likely has merged with the 1989 black dot release. 4 collections made up to 1995. 1999: Phone survey. Beetles present and reduced leafy spurge at release site. 2001: Scholastic site, now Highridge Bison Range Ltd owned by Ray Blais 937-7115. 5 Beetles/sweep in hot spots. Leafy spurge is thinned but a few plants set seed. GPS1 WP168.

Contact Person:

RM 438 Battle River SE 17-43-16 W3 Not a release	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1**		8				
Monitored in 2003	**1 to 3**		3	43			

N 52.70204 W 108.25722

Comments: 2002: Photo 2002 P7 - 010. Not a know release site. Black Dot established along a road ROW that was sprayed. Beetles are on leafy spurge growing in the fenceline. 2003: After a rain. Black Dot. Site photo, close up. 2003 P12 - 018, 019. GPS1 WP214.

Contact Person:

RM 438 Battle River SW 8-43-16 W3 SK-N-89-0022	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**8**	unlimited	35	60	86	6.6	
Monitored in 2001	**1**						

Black Dot Beetle Release in 1989. N 52.69845 W 108.29646

Comments: 1995: Site doing well, has merged with 1988 black dot release. 3 collections made. 1999: Phone survey. Beetles present and reduced leafy spurge at release site. 2001: Scholastic site, now Highridge Bison Range Ltd owned by Ray Blais 937-7115. GPS1 WP168.

Contact Person:

RM 438 Battle River SW 17-43-16 W3 SK-C-91-0015	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**2 to 5**	10 x 10	50	75			
Monitored in 2001	**1**		20	46			

Brown Dot Beetle Release in 1991. N 52.70332 W 108.29561

Comments: 1995: Site has improved slightly, zone of influence clearly visible. 1999: Phone survey. Beetles present and reduced leafy spurge at release site. 2001: Scholastic site, now Highridge Bison Range Ltd owned by Ray Blais 937-7115. Leafy spurge is thinned and some has set seed. Beetles were found over all of the pasture and along #4 Highway. The shoulder of #4 highway was sprayed for leafy spurge for 3 years, 1999, 2000 and 2001, and the beetles are doing fine on the sprayed site. GPS1 WP169.

Contact Person:

RM 442 Manitou Lake NW 26-43-27 W3 Artland1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**1 to 5**						

Beetles released ???. N 52.73098 W 109.81576

Comments: 2004: 12 UTM 5843003 579966 GPS2 WP525

Contact Person: Dave Shortt 446-7463

RM 442 Manitou Lake NW 27-43-27 W3 Artland2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**1 to 4**						
Beetles released ???				N 52.72895		W 109.82518	

Comments: 2004: 12 UTM 5842766 579334 GPS2 WP526

Contact Person: Dave Shortt 446-7463

RM 442 Manitou Lake NW 11-44-27 W3 Artland3	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2004	**0 to 3**						
Beetles released ???				N 52.77949		W 109.82001	

Comments: 2004: 12 UTM 5848349 579591 GPS2 WP527

Contact Person: Dave Shortt 446-7463

RM 442 Manitou Lake SW 16-44-27 W3 SK-N-88-0012	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**4 to 6**	70 x 70	55	50	90+		
Black Dot Beetle Release in 1988.				N 52.7867		W 109.8628	

Comments: 1995: Site doing fair. Beetles cover entire spurge area. Site marked with stake and surveyor's tape. 1999: Phone survey. Site sprayed with Roundup and now farmed, beetles move 1/4 mile away and are doing well.

Contact Person: Jim Gray 826-5623

RM 442 Manitou Lake NW 11-44-27 W3 SK-C-90-0068	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**15**	50 x 80	45	40	93.1	3.94	
Brown Dot Beetle Release in 1990.				N 52.7794		W 109.8145	

Comments: 1995: Site located in a cow graveyard. Site doing quite well. 5 collections made. 1999: Phone survey. Beetles present, some leafy spurge damage.

Contact Person: Brian McIntyre 826-5516

RM 463 Duck Lake SE 19-44-2 W3 SK-N-89-0018	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>20**	30 x 25	5 to 10	20	87	6	10

Black Dot Beetle Release in 1989. N 52.8485 W 106.2739

Comments: 1995: Excellent site. Harvestable in 1996.

Contact Person: Brian Seesaquasis 467-4760 or 467-4523: Landowner: Beardy's Reserve

RM 463 Duck Lake Farmer Released	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 1995	**>20**	33 x 28	3 to 4	20			10

Brown Dot Beetle Release in 1990 From Maxim.

Comments: 1995: Excellent site. Harvestable in 1996.

Contact Person: Unknown

RM 464 Leask NW 24-47-5 W3 Peake1	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**1 to 2**		4 to 10				
Monitored in 2003	**2 to 3**		4	41			
Monitored in 2005	**2 to 4**		17	74			

3000 Br Dot Beetles released on July 19,2001. N 53.06804 W 106.60788

Comments: Nearest town: Kilwinning. 2001: A grazed pasture but the cattle are not grazing the selected area. 2002: Release site. Photo 2002 P4 - 019, P7 - 001, 002. Photo 2002 P4 - 019. 2003: Almost raining. Site photo. 2003 P12 - 010 (toadflax), 012. 2005: 100% Black Dot. GPS1 WP166.

Contact Person: Landowner: Ron Peake 466-4656

RM 464 Leask NW 24-47-5 W3 Peake2	**No. of Beetles / Sweep**	Beetle Diameter (m)	No. of Flowering Stems / m2	Height of Leafy Spurge (cm)	%Sand	%Clay	% Bare Ground
Monitored in 2002	**<1**		0				
Monitored in 2003	**<1**		25	36			
Monitored in 2005	**1**		24	79			

9000 Br Dot (70%) & Bl (30%) Beetles released July 26, 2001. N 53.06810 W 106.60673

Comments: 2001: Release at the edge of a patch of leafy spurge where cattle graze. 2002: Release site. Photo 2002 P4 - 020, P7 - 003, 004. Black dots establishing. 2003: Almost raining. Black Dot. 2003 P12 - 012, 013. 2005: 100% Black. GPS1 WP167.

Contact Person: Garry Bowes 933-7695: Landowner: Ron Peake 466-4656

2006 Scentless Chamomile

Biological Control Agent Information Guide[1]

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Scentless Chamomile Gall Midge (*Rhopalomyia tripleurospermi*) Page 15

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Dear Colleague

This report contains recent information on the use of biological control agents to control scentless chamomile. This includes information on agent establishment and collection methods.

The text is updated, modified and reformatted from a previous publication, the Integrated Biocontrol Strategies for Noxious Weeds, Field Reference Manual by Brad Thompson. Photographs from the original publication are not included in this report. Additional information is included from leaflets supplied by Dr. A. McClay of the Alberta Research Council and the research article in Biological Control 14: 85-95 (1999).

As you read this report you will find that agents used on scentless chamomile have a different 'life style', compared to agents used for the control of leafy spurge. Scentless chamomile biological control agents are more mobile and quickly disperse from the release site. Therefore, they are harder to find when monitoring after a release.

If you have any comments on this report, please forward them to the author. Also, if you have time to monitor a site, please copy the appropriate monitoring form from this report and forward it to the author.

Best wishes,

Garry Bowes
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Scentless Chamomile[2]

Identification

Scientific name:	*Tripleurospermum perforatum (Merat) Lainz* (*Matricaria perforata* Merat)
Other common names:	wild daisy, false chamomile, or barnyard daisy
Origin:	Eurasia

Description

Flower The flowers of scentless chamomile are 2 - 4 cm in diameter and have white petals with central yellow disk florets. Their appearance is similar to a daisy. Flowers appear between June and September.

Stem & Leaves The stem is erect reaching heights of 15 - 100 cm. It is dark green in colour but is occasionally streaked red. The stem is multi-branched with fine dissected leaves.

Roots The fibrous roots of scentless chamomile may bind soil into large clumps after cultivation and when pulled. This enhances weed survival.

Reproduction This plant reproduces by seed. It is a prolific seed-producer. An over wintering plant can produce up to one million seeds in a single season. Normally the upper limit is 300,000 seeds per plant. Seed development is continuous throughout the summer. Therefore, at any one time the plant may contain immature flowers, seed heads, and mature seed. The seeds, also known as *achenes*, are dark brown or black with three distinctive light-brown ribs. They are approximately 2 mm in length. The seeds are spread by human activity, wind on crusted snow and water.

Life Cycle Scentless chamomile plants can be either an annual, winter annual or short-lived perennial depending on the time of germination. Seeds begin to germinate in the spring and can continue to germinate during the summer. Flowering can commence as early as 58 days alter germination. Early flowering scentless chamomile plants can be perennial and produce flowers and seeds all season long. Seeds, which germinate before mid-July, will produce a plant that flowers within the growing season. Seeds, which germinate after mid-July, will demonstrate the winter annual growth form. Winter annual plants remain vegetative for the remainder of the summer and over winter as rosettes. Next spring, the plant bolts and initiates flowering early in the season.

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[2] This text is modified from the Integrated Biocontrol Strategies for Noxious Weeds, Field Reference Manual by Brad Thompson, available from Saskatchewan Agriculture and Food. Photographs are not included. Information is added from leaflets supplied by Dr. A. McClay of the Alberta Research Council and a research article in Biological Control 14, 85 - 95 (1999).

Habitat Scentless chamomile grows in moist, disturbed areas such as roadsides, slough margins and farmyards. Preferred areas of growth are often at the edge between two habitats. Germination can occur after occasional spring floods, which provides a strong competitive advantage for establishment around sloughs and other low-lying areas. Once established in these areas, the sheer number of seeds released will facilitate the spread of scentless chamomile into cultivated fields.

Impact Scentless chamomile reduces yields in cereal, pulse, forage and oilseed crops. For example, 25 over wintered scentless chamomile plants/m^2 decreased spring wheat yield by 20 - 60%. Higher yield losses occur in wetter than normal years.

Comments Scentless chamomile may be mistaken for other plant species such as wild chamomile, pineapple weed or ox-eye daisy. The easiest way to differentiate scentless chamomile from either pineapple weed or wild chamomile is to look at the mature flowers. Pineapple weed flowers do not have the outer ring of white florets. In wild chamomile, the yellow centre is conical in shape, whereas in scentless chamomile it is much more rounded. Another way to differentiate scentless chamomile from similar plants is to grind the flower head. Both wild chamomile and pineapple weed have a characteristic pineapple-like odour, scentless chamomile, as the name implies, does not have this odour. Comparing the leaves of scentless chamomile and ox-eye daisy is the easiest way to tell the two species apart. Ox-eye daisy leaves are broad and coarsely toothed in comparison to the finely divided leaves of scentless chamomile.

Biological Control Agents

Biological Control Agent Profile:
Scentless Chamomile Seed Weevil
Omphalapion hookeri

The first release of seed weevils in Canada was in 1993. Seed weevils are approximately 2 mm long and are a shiny black colour.

Their life cycle begins in the spring (as early as the end of April) when over wintered adults emerge from the leaf litter or soil. Once emerged, the seed weevils feed on the leaves of chamomile plants. This continues until flower buds form on the plants. The females will then move up the plant and deposit eggs in a bud when the outer whorl of a flower (calyx composed of sepals) expands before the white ray petals start to develop. The process of feeding and egg lying by the adults continues until late July. The developing larvae feed on immature seeds in the flower head. When the larvae finish feeding, they pupate in the flower heads. New adults emerge from the seed heads in August, and depending on the timing, may begin feeding on the plants. By late summer newly emerged adults will move into the leaf litter or soil and over winter, thereby completing the cycle. There is one generation per year.

How the Seed Weevil Stresses Scentless Chamomile

Reduced seed production is the primary mode of control exerted by the seed weevil. Defoliation is not sufficient to stress scentless chamomile. At the Vegreville test site each seed weevil larvae eats about 11 seeds. A scentless chamomile seed head has about 171 seeds/head. After four years, there was an average of three seed weevils per flower head. The maximum number of seed weevils was 17 in a seed head collect near Canwood, Saskatchewan. On average, four years after a release, 40% of the seed heads contain a seed weevil larva.

Seed weevils tend to disperse rapidly from the release point and are thinly spread over large areas. According to Dr. McClay seed weevils can travel 2.7 km/yr. The population of the seed weevil is still increasing in Saskatchewan.

Success of Past Releases

In western Canada, 74% of the seed weevil releases have been successful. In a year, a seed weevil population has increased 17-fold and in rearing cages, net reproduction rates increased up to 64-fold.

Habitat and Climate Limitations

Habitat and climate factors do not appear to limited seed weevil establishment. Many infestations of scentless chamomile occur near sloughs or low-lying areas. Seed weevils have established on scentless chamomile plants growing in wet to marshy areas.

Why Release Sites Fail

Site failure is associated with environmental changes such as drought or human activities, such as mowing, construction, herbicide spraying and trampling by cattle.

Selecting a Release Site

Choosing a suitable site for release will greatly increase seed weevil establishment. When selecting a release site, try to meet the following criteria.

1) After release, do not disturb a release site. Do not apply herbicides, till or mow a new site. In addition, the site should receive little to no grazing until the insects establish a stable population. Try to protect the site for at least five years.

2) A site should be large enough to support a developed seed weevil population. Because seed weevils disperse, they will first thinly populate

all the scentless chamomile plants over an area. If the scentless chamomile infestation in the release area is large, then the seed weevil will slowly populate the area. Once an area is thinly populated, the seed weevil population will increase to an unknown number.

Collection for Initial Release

Collect scentless chamomile seed weevils only from sites where the seed weevil has successfully established itself.

Before collection for a release, it is essential to know the extent of the seed weevil establishment within a site to avoid collection of uninfested seed heads. To determine the average number of adult seed weevils per seed head at the collection site, use a pair of sharp scissors or a knife to harvest a 100 mature seed heads and place them in a container. Dissect each of the seed heads and count the number of adults present in each head. **A site is suitable for collection when the seed weevils are present in over 50% of 100 randomly sampled seed heads. Timing for collection is from the last week in July until the end of August.**

A good site can average three adult seed weevils per seed head. At the Alberta Research Council's test site at Vegreville, it took four years for the released seed weevil population to increase to three seed weevils per seed head. Remember to save any extracted adults from the dissections because they can form the basis of a release colony.

Release the seed weevils either in the spring/early summer or in the late summer/fall.

For **spring/early summer releases** store the seed weevils over winter. In the late summer/fall, collect seed heads with seed weevils from a site where the insect has established. Before the seed weevils are stored over winter, allow the adults to feed for 2 - 3 weeks on scentless chamomile. Collect the seed weevils and store them in plastic containers. Place this container in a large pail, which is filled with one-half inch of water, and keep at 0^0 C over winter. The seed weevils in the container should not be exposed to the water in the pail. When scentless chamomile comes into the bud stage in the spring, place the seed weevils in the field. Release sites should have a vigorous stand of scentless chamomile with plenty of flower buds. A release of 60 - 100 seed weevils is sufficient for successful establishment. The seed weevil has established following a release of 30 adults in the spring.

A release of 200 - 500 adult seed weevils is required to establish a site in the **late summer/fall**. Releasing a larger number of seed weevils will increase your chance for a successful establishment.

Choose one of the following methods to capture the seed weevils from seed heads.

Aspirator Method Spread the seed heads out in a large tray. When the seed weevils emerge, collect them with an aspirator. This is the most accurate method for collecting a sufficient number of seed weevils for release. However, this method is very time consuming, as the tray cannot be left unsupervised because the adults will escape. Secondly, aspirators and/or trays suitable for containing the emerging seed weevils may not be available.

Direct Distribution An alternative method is to distribute the collected seed heads at the release site, allowing the seed weevils to emerge on-site. The drawbacks associated with this method are that the actual number of adult seed weevils released will be unknown. The second drawback is that this method is slightly more sensitive to weather conditions 24 hours after release. Cool or wet conditions after a release will have a negative impact on the viability of the release population, as adults will not be as likely to emerge and may eventually die in the seed head.

Regardless of the release option selected, release the seed weevils as soon as possible after they are collected. If this is not possible due to weather conditions or travel, the insects can be stored in a cooler with ice packs, or in a fridge. Under these conditions, it is critical that the temperature does not fall below 4^0 C at any time during storage.

Mass Rearing

Seed weevils can be reared quite easily on potted scentless chamomile plants. In the spring, travel to a site, which has vigorously growing scentless chamomile plants. Select large over wintered plants in the rosette stage and put, one plant per pot, in 12-inch diameter pots. Move the potted plants to an appropriate site for timely watering, and fertilizing to promote rapid growth and plenty of flowers. The plants can be kept in a screened cage out doors or in a shelter location outdoors without screening. When the buds appear, put some seed weevils on the scentless chamomile plants. One large healthy scentless chamomile plant can easily accommodate 100 adult seed weevils. Obtain the seed weevils from a site where they have previously established or use seed weevils that were stored over wintered.

Establishing a Release Site

Equipment Needed:

When releasing seed weevils, you will need the following equipment:

- stake
- sledge hammer

- camera
- pen and paper
- $^{1}/_{4}$ m^2 quadrat
- GPS receiver

Stake and photograph the release site for future reference. Use a $^{1}/_{4}$ m^2 quadrat to sample the density of scentless chamomile. Use a GPS (Global Positioning System) which is a satellite-based navigation system to record the position (latitude and longitude) of the site.

Ambient temperature is an important factor to consider when making a release. Temperatures above 28^{0}C can dramatically increase mortality; therefore transport the seed weevils to the release site in a cooler with ice packs. Conversely, cool temperatures (<18^{0}C) are not beneficial for a release, as the seed weevils will not be sufficiently active.

Selecting the Release Point

Although many scentless chamomile infestations are located near sloughs or low-lying areas, keep release sites away from areas that are expected to flood in the spring. Give the seed weevils the best opportunity that you can to establish. Spring run-off can drown over-wintering adults when a release is too close to sloughs or low-lying areas. Secondly, do not release seed weevils near anthills or wasp nests. Ants and wasps are enemies of seed weevils

Making the Release

Released the insects in the centre of the stand and mark the location with a clearly visible stake. To release the insects, place the opened shipping container on the ground near the stake and leave undisturbed for 10 - 15 minutes. This allows the insects to adjust to their new environment (particularly important if they were in a fridge or a chilled cooler immediately before release). Allow the insects to exit the container. Gently shake the remaining insects out within 1 - 3 metres of the stake. This distribution lessens the risk of mortality from predacious insects. Finally, complete a release record sheet. If you do not have a copy of a release form, photocopy the example in this document.

The release record sheet used by Saskatchewan Agriculture and Food is included in this document. Information on site characteristics is important to determine insect establishment and to assess the effect seed weevils will have on scentless chamomile. Use a $^{1}/_{4}$ m2 quadrat to sample the number of flowering stems per square meter.

This information is essential to determine the appropriate conditions for a successful seed weevil biological control site. Sharing the pooled release data benefits all biological control participants in the long term.

Assessment of Scentless Chamomile Seed Weevil Establishment: Annual Site Evaluation

Monitoring Protocols

It is important to follow up seed weevil releases on an annual basis to record seed weevil establishment. Saskatchewan Agriculture and Food use this data to make better recommendation for future release and insect handling procedures. Seed weevil sites require two follow-up visits per year.

Presence or Absence of Adults

The first visit should occur on a warm sunny day in late June or early July. The purposes of this visit are to verify that adults have emerged from the leaf litter, and to obtain a rough estimate of the number of seed weevils present. Complete the form, 'Seed Weevil (*Omphalapion hookeri*) Field Data Sheet 1: Presence or Absence', to ensure all of the necessary information is collected. If you do not have this form, then print and photocopy the form, which is available in this document.

The site and sampling data sections are self-explanatory; weather conditions apply to the weather on the sampling day and, if applicable, the night before (i.e. if it had rained). Weather conditions have a major effect on the number of insects found at any one time. Therefore, knowing this is important in determining the difference between a poorly performing site and a good site evaluated on a poor day. For the insect density estimate, the best procedure is to start 5 - 10 meters away from the release point and begin to carefully circle toward your release point, visually inspecting the plants for seed weevils as you move closer. Shiny black seed weevils on the flower buds of scentless chamomile plants should be obvious. Set your watch to determine the number of adults that you can find in 30 minutes. Record the results. If adults are not found after 30 minutes then record zero. For this level of monitoring you should not need longer than 45 minutes per site to evaluate a site. The miscellaneous information section on the data sheet pertains to other relevant information. Examples of this type of information include a late frost, an intense hailstorm, possible pesticide drift or information on any event that may have affected the insect or the scentless chamomile population. This information is helpful in determining why a site may have failed. For example, adverse environmental conditions could eliminate a population in its early stage of development even though site selection and insect release were optimal.

Scentless Chamomile Stand Assessment

The second visit to the release site should occur in mid to late August when the scentless chamomile seed heads are beginning to ripen but before seed dispersal. The methodology used for this visit depends on the results of the June/July visit. If the June/July visit detected adults, assess the site for damage, using the 'Seed Weevil (*Omphalapion hookeri*) Field Data Sheet 2: Scentless Chamomile Assessment' sheet, included in this document. If the June/July visit detected no adults, then sample the seed heads to obtain a more accurate estimate of the level of seed weevil establishment. If seed weevils are present at a site, then filled out the Seed Weevil Field Data Sheet 2. If no evidence of seed weevils or seed weevil presence is found in the seed heads then nothing further should be done until the following June. The next year, the process should be repeated (both site visits performed) to determine if seed weevils are present. If you are unable to find seed weevils in the following year, then consider the seed weevil establishment unsuccessful.

Sampling for seed weevil larvae or pupae in the seed heads consists of randomly removing approximately 200 seed heads from within 10 meters of the release point. Package the heads into a clean, dry container and label with the release reference number. Then take the seed heads to a laboratory or any other location suitable for seed head dissected. Seed heads are dissected to determine the number and the developmental stage of seed weevils found (a magnifying glass or dissecting scope may be helpful for this). In seed heads where the adults have emerged, simply count the vacated cells. For further information of sampling techniques, please contact:

Dr. Rose DeClerke-Floate
Weed Biological control
Agriculture and Agri-Food Canada Research Centre
Corner of Highway 3 & 43rd Ave.
Lethbridge, Alberta T1J 4B1
(403) 327-4561

The purpose of the second field data sheet is to assess the effect of the seed weevil on the general vigour of the scentless chamomile infestation. The format of the form matches the format and content of the release form to allow for easy comparison. The nature of the seed weevil is such that it does not significantly stress the scentless chamomile plant but serves to reduce its reproductive capability.

When to Harvest for Redistribution

Collection at a site for redistribution can commence when seed weevils infest 50% of a random sample of 100 mature seed heads. It may take at least five years for seed weevils to infest 50% of the seed heads. Exercise caution when initiating a collection for redistribution, because the removal of too many mature adults may adversely affect seed weevil establishment the following year. Infestation rates in successful locations should be significantly higher than 50%. In Nova Scotia, typically exhibit infestation rates range between 85 - 95%. It is too early to tell what seed weevil infestation rates can be expected in Saskatchewan.

Biological Control Agent Profile:
Scentless Chamomile Stem Weevil
Microplontus edentulus

Biology

This weevil lays eggs in the upper parts of stems of bolted scentless chamomile plants. The adults are about 3 mm in length, mottled grey, and have a distinctive whitish "arrow" marking on the back, pointing towards the head. The larvae feed inside the stems, and will tunnel up the branches into the bases of the flower heads. In late summer, the mature larvae cut an exit hole in the stem, crawl out of the stems and drop into the soil, where they quickly burrow into the soil. In the soil, the stem weevils pupate and over winter. In the spring over wintered adults emerge from the soil. There is one generation per year.

Current Status

In 1997, Plant Health and Production Division of the Canadian Food Inspection Agency approved the release of the scentless chamomile stem weevil in Canada. Dr. Alec McClay at the Alberta Research Council (ARC) at Vegreville developed a rearing method for the insect and they are maintaining a breeding colony. Rearing is more labour-intensive than for the seed weevil (*O. hookeri*), and the insects are still in short supply.

ARC released the stem weevil at several sites in British Columbia, Alberta, Saskatchewan, and Manitoba. The good news is that, as of May 1999, ARC has confirmed that the stem weevil has survived for two years on research plots at Vegreville, when the scentless chamomile plants infested with the stem weevil were transplanted into a field. Establishment has not yet been detected at any of the other release sites in Saskatchewan, unless a release was made under a fine-mesh screen cage. The adults are quite good fliers and they will dispersed quickly from the release sites. Thus, even if they are established and breeding at these sites, they may not have shown up in the limited stem samples collected around the release points.

How the Stem Weevil Attacks Scentless Chamomile

At the site where the stem weevil was released in transplanted plants, adults and attacked stems were found the first and second year after release. Stem weevils eat the interior of the scentless chamomile stems, leaving hollow areas or 'mines'. Two years after release, 62% of the stems, located 100 metres from the release point, showed mining activity by the stem weevil larvae. There were two mines per attached stem.

In potted scentless chamomile plants, the stem weevil has reduced the number of stems and flower heads of the noxious weed. This has not been demonstrated under field conditions in Canada.

Release

Once stem weevils are available, ARC suggests that we use the following procedure when releasing the insect. To make it easier to detect establishment of the insect, ARC suggests that adults should be released under fine-mesh screen cages. A cage should be set up over a dense, vigorous patch of scentless chamomile, which is producing plenty of thick flowering stems. Release the weevils into the cage, which is then left in place for 2 weeks. The weevils should then disperse from the cage and infest plants over a larger area. Using this procedure, it will be possible to determine whether the stem weevils have been breeding on the plants in the caged area.

Monitoring

Adult stem weevils may be difficult to find during the first few years after a release because they move around well and they thinly populate a release area.

Biological Control Agent Profile: Scentless Chamomile Gall Midge

Rhopalomyia tripleurospermi

Biology

Adult scentless chamomile gall midges are tiny, delicate flies, which live only for a few hours. The females lay eggs in the growing points of scentless chamomile plants. Larvae hatch out from these and feed in the meristematic tissue, causing it to swell into a gall. The gall is visible as a mass of short crowded leaf-like growths, with a "mossy" appearance. Galls can be induced in the growing tips of rosettes and bolting plants, leaf axils, buds and flowers. Galls can contain up to 80 chambers, each will a single larva. In cultures in a laboratory, females produced an average of 61 offspring. These galls interrupt and stunt the normal growth of the plant, and reduce its flowering. Adults emerge from the galls after a few weeks, and there can be several generations over a growing season.

Current status

The Plant Health and Production Division, Canadian Food Inspection Agency granted approval for field release of the gall midge in March 1999. ARC has been rearing the gall midge on potted scentless chamomile plants in the greenhouses at Vegreville, and the colony is thriving. The biggest problem is producing enough scentless chamomile plants to supply the agent! The gall midge is able to survive over winter under Canadian conditions.

Gall midges can travel 5.2 km/yr.

Future Plans

In Saskatchewan, gall midges will be collected and sent to those requesting the biological control agent.

It is possible to establish gall midges by transplanting 12 scentless chamomile plants with galls that are obtained from previous releases. When growth commences in the spring, it is time to dig up scentless chamomile plants with galls. Transplant the plants with a gall in a new location. Water if the soil is dry. As the adult midges emerge from galls, they should lay eggs on the surrounding plants to start up a new field population.

Selecting a Release Site

While choosing a suitable site for release will greatly increase gall midge establishment, it is not known what habitat or environmental factors affect establishment. However, try to meet the following general criteria.

1) After release, do not disturb a release site. A site should not be treated with herbicides, tilled or mowed, and should receive little to no grazing until the insects establish a stable population. Try to protect the site for 3 to 5 years.

2) A site should be large enough to support a developed gall midge population. The site should contain many rather than a few scentless chamomile plants.

Establishing a Release Site

Equipment Needed

To properly release gall midges, you will need the following equipment:

- stake
- sledge hammer
- camera
- pen and paper
- $^1/_4$ m^2 quadrat
- shovel
- GPS receiver

Stake and photograph the release site for future reference. Use the $^1/_4$ m^2 quadrat to sample the density of scentless chamomile. Dig a hole in the soil with a shovel and transplant the 12 scentless chamomile plants with galls. It is highly desirable to use a GPS (Global Positioning System) receiver which is a satellite-based navigation system to record the position (latitude and longitude) of the site. Please complete a copy of the release form, which is printed in this document and forward it to the author.

Selecting the Release Point

Although many scentless chamomile infestations are located near sloughs or low-lying areas, select an upland site away from water, including the high spring water level.

Making the Release

Release the insects in the centre of the stand and mark the release site with a clearly visible stake.

Adult gall midges live for only a few hours so it is necessary to transport the biological control agent in galls with scentless chamomile plants. Transplant 12 plants with galls into a patch of scentless chamomile. Adult gall midges tend to come out as groups and then live for only a few hours. Because a group is either all males or females, transplant 12 plants per site to ensure mating.

To ensure the successful establishment of the scentless chamomile plants and gall midges, it is important to **water the plants when the soil becomes dry.**

Finally, a release record sheet should be completed and sent to the author.

The release record sheet used by Saskatchewan Agriculture and Food is included in this report. Information on site characteristics is important to determine insect establishment and to assess the effect gall midges will have on scentless chamomile. Use a $^1/_4$ m^2 quadrat to sample the number of flowering stems per square meter.

This information is essential to determine the appropriate conditions for a successful gall midge biological control site. Sharing the pooled release data benefits all biological control participants in the long term.

Seed Weevil *(Omphalapion hookeri)* Release Form

Scentless Chamomile

Release Number: ____________	Date: ____________
Legal Location: ____________	Number Released: ____________
GPS Reading: ____________	RM # ____________
Released by:	**Landowner:** (if different from release person)
Name: ____________	Name: ____________
Address: ____________	Address: ____________
City: ____________	City: ____________
Postal Code: ____________	Postal Code: ____________
Phone: ____________	Phone: ____________

Site Characteristics (check applicable choices)

Biological

Infestations (check one)	_____ Continuous	_____ Patchy	
Extent:	_____ <2.5 ha (<6 acres)	_____ 2.5-10 ha (6 - 25 acres)	_____ >10 ha (>25 acres)
Flowering stems/m2	_____ 0-20	_____ 20-35	_____ >35
Cover (all vegetation):	_____ 0-25%	_____ 20-75%	_____ 75-100%
Trash cover:	_____ 0-5% _____ 25-50%	_____ 5-10%	_____ 10-25%

Weather conditions: (temperature, sunny rain, etc.) ____________________

____

Land Use

Current use	_____ Pasture	_____ Crop	_____ Right-of-way
	_____ Other	⇨ describe: ____________	
Herbicides within 2 yrs:	_____ Yes	_____ No	

if yes, type: ____________________

rate: ____________________

Miscellaneous Information

(comments concerning adverse weather or agronomic conditions that could influence either insect#'s (ie pesticide drift) or the weed stand)

____

____

____

____

Return to:
Garry Bowes, 3830 Thatcher Avenue, Saskatoon, SK, S7K 2H6
Phone: 933-7695, Fax: 933-7352 e-mail: gbowes@agr.gov.sk.ca

Seed Weevil (Omphalapion hookeri) Field Data Sheet 1:

Scentless Chamomile Presence or Absence

SITE DATA

Release Number: ______________ Date: ____________________

Assessment person(s): ____________________

(please specify all parties taking part in the **COUNTING**) RM: ____________________

____

____

Contact Phone: ____________________ Legal Location: ____________________

SAMPLING DATA:

Time: ______________ Temperature: ______________

Weather conditions at time of sampling (sunny, windy, etc.):__________________________

____

Weed patch size: ______________

Plant Phenology: _______ No flower buds showing (vegetative)

(Check predominant one) _______ Early bud stage

_______ Flowers starting to open

INSECT DENSITY ESTIMATE

_______ YES Presence of adults found in 30 minutes

If yes, time taken to find adults : _________

or number of adults found in 30 minutes: ________

_______ NO (adults not found in 30 minutes)

Approximate area searched: ____________

MISCELLANEOUS INFORMATION

(comments concerning adverse weather or agronomic conditions that could influence either insect #'s (i.e. pesticide drift) or the weed stand)

____

____

____

Return to:

Garry Bowes, 3830 Thatcher Avenue, Saskatoon, SK S7K 2H6

Phone: 306 933-7695, Fax: 306 933-7352, E-mail: gbowes@agr.gov.sk.ca

Seed Weevil (*Omphalapion hookeri*) Field Data Sheet 2:

Scentless Chamomile Assessment

SITE DATA

Release Number: ____________________ Date: ______________

Assessment person(s): ____________________ RM: ______________

Contact phone #: ____________________ Legal Location: ______________

SAMPLE DATA (check applicable choices)

Biological

Infestations (check one) _____ Continuous _____ Patchy

Extent:	_____ <2.5 ha (<6 acres)	_____ 2.5-10 ha (6 - 25 acres)	_____ >10 ha (>25 acres)
Flowering stems/m2	_____ 0-20	_____ 20-35	_____ >35
Cover (all vegetation):	_____ 0-25%	_____ 20-75%	_____ 75-100%
Trash cover:	_____ 0-5%	_____ 5-10%	_____ 10-25%
	_____ 25-50%		

Chemical

Herbicides within past year: _____ yes _____ no

if yes, type: ________________________________

rate: ________________________________

MISCELLANEOUS INFORMATION

(comments concerning adverse weather or agronomic conditions that could influence either insect#'s (ie pesticide drift) or the weed stand)

____

____

____

____

Return to:
Garry Bowes, 3830 Thatcher Avenue, Saskatoon, SK S7K 2H6
Phone: 306 933-7695, Fax: 306 933-7352, E-mail: gbowes@agr.gov.sk.ca

Stem Weevil *(Microplontus edentulus)* Release Form

Scentless Chamomile

Release Number: ____________ Date: ____________
Legal Location: ____________ No. Released: ____________
GPS Reading: ____________ RM # ____________

Released by:
Name: ____________________
Address: ____________________
City: ____________________
Postal Code: ____________________
Phone: ____________________

Landowner: (if different from release person)
Name: ____________________
Address: ____________________
City: ____________________
Postal Code: ____________________
Phone: ____________________

Site Characteristics (check applicable choices)

Biological

Infestations (check one)	_____ Continuous	_____ Patchy	
Extent:	_____ <2.5 ha (<6 acres)	_____ 2.5-10 ha (6 - 25 acres)	_____ >10 ha (>25 acres)
Flowering stems/m2	_____ 0-20	_____ 20-35	_____ >35
Cover (all vegetation):	_____ 0-25%	_____ 20-75%	_____ 75-100%
Trash cover:	_____ 0-5% _____ 25-50%	_____ 5-10%	_____ 10-25%

Weather conditions: (temperature, sunny rain, etc.) ____________________________________
____

Land Use

Current use	_____ Pasture	_____ Crop	_____ Right-of-way
	_____ Other	⇨ describe: ____________	
Herbicides within 2 yrs:	_____ Yes	_____ No	

if yes, type: ____________________
rate: ____________________

Miscellaneous Information

(comments concerning adverse weather or agronomic conditions that could influence either insect#'s (ie pesticide drift) or the weed stand)

____
____
____
____

Return to:
Garry Bowes, 3830 Thatcher Avenue, Saskatoon, SK S7K 2H6
Phone: 306 933-7695, Fax: 306 933-7352, E-mail: gbowes@agr.gov.sk.ca

Gall Midge (Rhopalomyia tripleurospermi) Release Form

Scentless Chamomile

Release Number: ____________
Legal Location: ____________
GPS Reading: ____________

Date: ____________
No. Released: ____________
RM # ____________

Released by:
Name: ____________
Address: ____________
City: ____________
Postal Code: ____________
Phone: ____________

Landowner: (if different from release person)
Name: ____________
Address: ____________
City: ____________
Postal Code: ____________
Phone: ____________

Site Characteristics (check applicable choices)

Biological

Infestations (check one)	____ Continuous	____ Patchy	
Extent:	____ <2.5 ha (<6 acres)	____ 2.5-10 ha (6 - 25 acres)	____ >10 ha (>25 acres)
Flowering stems/m2	____ 0-20	____ 20-35	____ >35
Cover (all vegetation):	____ 0-25%	____ 20-75%	____ 75-100%
Trash cover:	____ 0-5% ____ 25-50%	____ 5-10%	____ 10-25%

Weather conditions: (temperature, sunny rain, etc.) ____________
____

Land Use

Current use	____ Pasture	____ Crop	____ Right-of-way
	____ Other	⇨ describe: ____________	
Herbicides within 2 yrs:	____ Yes	____ No	

if yes, type: ____________
rate: ____________

Miscellaneous Information

(comments concerning adverse weather or agronomic conditions that could influence either insect#'s (ie pesticide drift) or the weed stand)

____
____
____
____

Return to:
Garry Bowes, 3830 Thatcher Avenue, Saskatoon, SK, S7K 2H6
Phone: 933-7695, Fax: 933-7352 e-mail: gbowes@agr.gov.sk.ca

MONITORING RECORD FOR Gall Midge (*Rhopalomyia tripleurospermi*)	**Release Identifier:** ________
Date monitored (YYMMDD)	Time Monitored (range)________
Agent Name *Rhopalomyia tripleurospermi* Weed Scientific Name *Matricaria perforata* Weed Common Name scentless chamomile	Site Name/Location ________ ________

Monitored by

Last Name	First Name	Affiliation	Telephone
			( ) -

Photographs taken? Y/N
Frame Numbers

Monitoring information

How many of the original nine transplanted plants are alive?	Weed Canopy Height cm

Please search, first within your original transplant square, and then in the immediately surrounding area for galls. Search until you find ten galls (not including those on the transplanted plants) or for 30 minutes, whichever comes first. For each gall, indicate how far and which direction it is from the nearest transplanted plant if it is not within the original transplant square. Also indicate on which part of the plant the gall was found (see attached pictures).

Gall #	Found within transplant square?	Which type/where is the gall on the plant?					
1	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
2	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
3	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
4	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
5	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
6	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
7	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
8	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
9	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other
10	Y/N	rosette	shoot base	shoot tip	leaf axil	flower	other

Greatest distance of insect spread	Direction of greatest insect spread	**If you found ten galls in less than 30 minutes, approximately how long did it take?**

OTHER NOTES:

Table 1. List of Release Sites for Scentless Chamomile Seed Weevils

(Adult # Found = Adult number found in a spring count.
% Heads Infested = Percentage of seed heads with at least one weevil in the fall.)

RM 6	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 14-1-12 W1	18-Jun-99	60	?			
SK-99-126						
Contact Person:	Hugh Schnell	Phone #:	923-4604	GPS:	49.04	103.4975 Cal
Comments:						

RM 32	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 4-4-32 W1	8-Jun-01	30	>35			
SK-01-167						
Contact Person:		Phone #:	482-9671	GPS:	49.2688	101.7284 Cal
Comments: Landowner; John McNeil 489-4812. Released in a pasture.						

RM 33	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 4-4-32 W1	11-Jun-01	60	0-20			
SK-01-181						
Contact Person:		Phone #:		GPS:	49.2688	101.7284 Cal
Comments: Landowner: John McNeil 489-4812. Edge of slough in a crop field.						

RM 49	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 31-5-19 W3	17-Jun-99		20-35			
SK-99-105						
Contact Person:		Phone #:		GPS:	49.4329	108.5395 Cal
Comments:						

RM 63	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 5-7-2 W2	8-Jun-01	30	0-20			
SK-01-167						
Contact Person:		Phone #:		GPS:	49.5273	102.248 Cal
Comments: Landowner; Jack Doty 453-6013.						

RM 63	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 5-7-2 W2	11-Jun-01	60	0-20			
SK-01-178						
Contact Person:		Phone #:		GPS:	49.5273	102.2428 Cal
Comments: Landowner: Jack Doty 453-6013. Released on the edge of a slough in a crop field.						

RM 79	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 2-8-20 W3	6-Jul-05	60	*****	*****	*****	*****
SK-05-190						
Contact Person:	Doris Poisson	Phone #:	297-2081	GPS:	49.6147	108.603 Cal
Comments: Landowner Doris Poisson						

RM 79	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 36-7-20 W3	6-Jul-05	60	*****	*****	*****	*****
SK-05-204						
Contact Person:	Doris Poisson	Phone #:	297-2081	GPS:	49.6074	108.5804 Cal
Comments: Landowner Edgar Codderre.						

RM 94	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 36-12-5 W2	5-Jun-01	60	0-20			
SK-01-161						
Contact Person:	Larry Wiesner	Phone #:	736-2655	GPS:	50.0367	102.563 Cal
Comments: Landowner: Ken Shoemaker						

RM 98	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 23-11-17 W2	17-Jun-99	60	>35	2000	0	
SK-99-123				2003	0	
				2004	1	
				2005	0	
Contact Person:		Phone #:		GPS:	49.9304	104.22482
Comments: Also contact person, Ray Beck 464-2116. Agriculture Fieldworker for RM #98. Released near the gall midge sites. Owner decided to control all scentless chamomile in crop and right-of-way; Roundup in fall of 1999, Roundup in spring of 2000 and in crop herbicide. 2003: Continue to fill slough. Very few plants. 2004: 2004 P11 - 011, 012. 2005: 2005 P4 - 019. GPS1 WP037.						

RM 98	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 24-11-17 W2	7-Jun-00	60	>35	2000	0	
SK-00-153				2003	0	
				2004	0	
Contact Person:		Phone #:		GPS:	49.93052	104.1985
Comments: Release between road, road right-of-way and abandoned dugout. 2003: Very few plants. 2003 P3 - 025. 2004: In 15 min, viewed all of the plants. GPS1 WP038.						

RM 98	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 25-11-17 W2	9-Jun-00	60	20-35	2000		
SK-00-154				2003	0	
				2004		
				2005	0	
Contact Person:		Phone #:		GPS:	49.94206	104.20364
Comments: Released along the grassed edge of the Yellow Grass main drainage ditch in cultivated land, behind the old stone house. To wet to sample on July 12, 2000. 2002: Old galls, gall on a perennial (2), old gall. P11 - 008, 009, 010, 011. 2003: Very few plants. 2004: Could not monitor, could not cross the drainage ditch. 2004 P11 - 013, 014. 2005: 2005 P4 - 020. GPS1 WP122.						

RM 109	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 22-10-20 W3	9-Jun-00	60	0-20				
SK-00-151							
Contact Person:		Phone #:		GPS:	49.8331	108.6255 Cal	
Comments:							

RM 109	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 22-10-20 W3	30-Aug-96		20-35				
SK-96-058							
Contact Person:	Al Holtsmeyer	Phone #:	662-3599	GPS:	49.8404	108.6368 Cal	
Comments:							

RM 109	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NE 36-10-20 W3	8-Jun-01	25					
SK-01-173							
Contact Person:	Darcy Jacksteit/D. Aldag	Phone #:	672-37-28	GPS:	49.8695	108.5834 Cal	
Comments: Landowner: Don Aldag 672-3728.							

RM 109	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 22-10-20 W3	17-Jun-99	60	0-20				
SK-99-111							
Contact Person:		Phone #:		GPS:	49.8404	108.6368 Cal	
Comments:							

RM 110	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 12-10-22 W3	9-Jun-00	60	0-20				
SK-00-150							
Contact Person:		Phone #:		GPS:	49.804	108.8627 Cal	
Comments:							

RM 121	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 9-14-31 W1	7-Jun-01	60	20-35				
SK-01-166							
Contact Person:	Marshall McLeod	Phone #:	435-4242	GPS:	50.1749	101.6649.	Cal
Comments: Landowner: Konrod Johnson							

RM 121	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NE 33-13-31 W1	1996			1999	0		
SK-96-067				2003	4		
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.14235	101.65882	
Comments: On the roadway, east of the elevator. The site was mowed. 2003: Site photo. 2003 P3 - 013. GPS1 WP185.							

RM 121	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 7-14-31 W1	*****	*****	*****	2002	20	*****	
SK-				2003	77		
Contact Person:	M. McLeod	Phone #:	435-4242	GPS:	50.16708	101.70925	
Comments: 2002: East of Mainline Terminal. Photo 2002 P3 - 007. 20 found in 30 min. 2003: 77 found in 20 min. Five weevils on a flower, site. 2003 P3 - 011, 012. GPS1 WP208.							

RM 122	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 1-15-33 W1	1-Sep-95		>35	1996	10		
SK-95-??							
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.2484	101.9038 Cal	
Comments: 1997: Site was under water all year. 1999: Site destroyed.							

RM 122	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 1-15-33 W1	1996			1999	112		
SK-96-071				2002	227		
				2003	171		
				2004	26		
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.25455	101.92494	
Comments: Released on the left side of the rock pile near the slough. 2002: Weevils at rock pile, isolated plant, site with weevils, close up. Photo 2002 P3 - 008, 009, 010, 011. 227 found in 15 min. 2003: Many weevils on plants and rock pile. 2003 P3 - 008, 009, 010. 2004: 2004 P - 011 to 021, P4 - 001 to 004. GPS1 WPAA09.							

RM 123	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 30-15-2 W2	1-Sep-95	500	>35	1996	0		
				1997		16	
				1998		10	
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.284	102.2691 Cal	
Comments:							

RM 124	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NE 25-15-6 W2	1-Sep-95	500	0-20	1996	0		
SK-95-040							
Contact Person:		Phone #:		GPS:	50.2913	102.6932 Cal	
Comments: 1996: Cattle grazed the release site and plants were short.							

RM 124	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 20-13-6 W2	6-Jun-00	60	0-20				
SK-00-157							
Contact Person:		Phone #:		GPS:	50.1022	102.7904 Cal	
Comments:							

RM **130**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 30-13-22 W2	17-Jun-99	60	0-20				
SK-99-121							
Contact Person:			Phone #:		GPS:	50.1095	104.9856 Cal
Comments: Requested by Ian Dow.							

RM **151**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 3-18-33 W1	1-Sep-95		0-20	1996	1	1	
SK-95-??				1997		3	
				1998		2	
				1999	31	5	
				2000		0	
				2003	36		
Contact Person:	Cynthia Kitchen		Phone #:	435-2303	GPS:	50.51102	101.96202
Comments: 1997: No plants at release site but on the opposite side of the road, along the road edge there were lots of plants and lots of weevils. 2000: Found only 3 seed heads. 2003: Few plants growing on road shoulder and on gravel site in brome. 2003 P3 - 017. GPS1 WPAA08.							

RM **151**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 13-17-32 W1	2-Sep-96		0-20	1997	2		
SK-96-068				1999	20	14	
				2000		100	
				2003	0		
Contact Person:	Cynthia Kitchen		Phone #:	435-2303	GPS:	50.50285	101.89038
Comments:1997 - No scentless chamomile plants at the release site. S.C. plants were 50 yds uphill and 100 yds downhill. Plants were found across the road. 2000: Found only 2 seed heads. 2003: No plants found. GPS1 WPAA07.							

RM **152**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NE 5-18-31 W1	28-Jun-05	*****	*****	*****	*****	*****	
SK-05-192							
Contact Person:	Marsh McLeod		Phone #:	435-9322	GPS:	50.5128	101.7057
Comments: Landowner unknown. Released by Qu'Appelle River. GPS2 WP576.							

RM **152**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
*****	28-Jun-05	*****	*****	*****	*****	*****	
SK-05-193							
Contact Person:	Marsh McLeod		Phone #:	435-9322	GPS:		
Comments: Landowner unknown. Released by Qu'Appelle River.							

RM **152**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
*****	28-Jun-05	*****	*****	*****	*****	*****	
SK-05-194							
Contact Person:	Marsh McLeod		Phone #:	435-9322	GPS:		
Comments: Landowner unknown. Released by Qu'Appelle River.							

RM 152	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 36-17-30 W1	27-Jun-05	*****	*****	*****	*****	*****
SK-05-195						
Contact Person:	Marsh McLeod	Phone #:	435-9322	GPS:	50.4929	101.4876
Comments: Landowner unknown. Released by Qu'Appelle River. GPS2 WP572.						

RM 152	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 6-18-31 W1	27-Jun-05	*****	*****	*****	*****	*****
SK-05-196						
Contact Person:	Marsh McLeod	Phone #:	435-9322	GPS:	50.5057	101.7373
Comments: Landowner unknown. Released by Qu'Appelle River. GPS2 WP571.						

RM 152	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 36-17-30 W1	27-Jun-05	*****	*****	*****	*****	*****
SK-05-197						
Contact Person:	Marsh McLeod	Phone #:	435-9322	GPS:	50.4885	101.4783
Comments: Landowner unknown. Released by Qu'Appelle River. GPS2 WP570.						

RM 152	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 3-18-32 W1	28-Jun-05	*****	*****	*****	*****	*****
SK-05-198						
Contact Person:	Marsh McLeod	Phone #:	435-9322	GPS:	50.5073	101.8044
Comments: Landowner unknown. Released by Qu'Appelle River. GPS2 WP573.						

RM 152	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 8-16-31 W1	28-Jun-05	*****	*****	*****	*****	*****
SK-05-199						
Contact Person:	Marsh McLeod	Phone #:	435-9322	GPS:	50.3491	101.7059
Comments: Landowner unknown. Released by Qu'Appelle River. GPS2 WP577.						

RM 152	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 2-18-32 W1	28-Jun-05	*****	*****	*****	*****	*****
SK-05-200						
Contact Person:	Marsh McLeod	Phone #:	435-9322	GPS:	50.515	101.7866
Comments: Landowner unknown. Released by Qu'Appelle River. GPS2 WP574.						

RM 152	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 32-17-31 W1	28-Jun-05	*****	*****	*****	*****	*****
SK-05-201						
Contact Person:	Marsh McLeod	Phone #:	435-9322	GPS:	50.4983	101.7217
Comments: Landowner unknown. Released by Qu'Appelle River. GPS2 WP575.						

RM 153	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 14-18-1 W2	9-Jun-01	30				
SK-01-174-01						
Contact Person:	G Swanson	Phone #:	735-2879	GPS:	50.5169	102.0401 Cal
Comments: Landowner: Denis Fiakola, 745-3747.						

RM 153	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 36-17-2 W2	9-Jun-01	30		2003	15	
SK-01-174-02				2004	14	
Contact Person:	G. Swanson	Phone #:	735-2879	GPS:	50.44986	102.21236
Comments: Landowner: RM of Willowdale. Release on a right-of-way. 2003: 15 found in 20 min. Photo. 2003 P3 - 020. 2004: 2004 P4 - 005, 006, 007 GPS1 WP207.						

RM 153	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 17-18-1 W2	1-Sep-95	500	0-20	1996	2	
				1998		0
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.5242	102.0973 Cal
Comments: 1996: No plants at the release site. Weevils were found 10' from the release site at the edge of the road. 1998: No plants, the area was cleaned up. 1999: Site lost.						

RM 153	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 20-16-2 W2	1-Sep-95	500				
SK-95-??						
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.3568	102.2462 Cal
Comments: 1999: Site destroyed.						

RM 153	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 26-17-2 W2	1996	60		1999	1	
SK-96-069				2003	138	
				2004	14	
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.45529	102.16683
Comments: Found the weevil along the field edge. 2003: 5 weevils on a branch, field corner. 2003 P3 - 018, 019. 2004: in corner of the field, along the bush and across the road. 2004 P4 - 009, 010. GPS1 WP187.						

RM 153	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 20-16-2 W2	2-Sep-96	500	20-35	1997		0
SK-96-070						
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.3568	102.2348 Cal
Comments: 1999: Site destroyed.						

RM 154	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 5-17-4 W2	1995	60		1999	85	
SK-95-044				2002	361	
				2003	103	
				2004	4	
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.39702	102.52233

Comments: Moved 500 ft from the original site to the field. 2002: Close up, plants with weevils, release area, plants with weevils behind release site. Photo 2002 P3 - 012, 013, 014, 015. 361 found in 15 min. 2003: Scentless chamomile at edge of the field. 2003 P2 - 004, 005, 006. 2004: 2004 P4 - 011. GPS1 WPAA15.

RM 156	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 24-18-13 W2	1-Sep-95	500	>35	1997		0
SK-95-043				1999	2	
				2002	120	
				2003	47	
				2004	3	
Contact Person:		Phone #:		GPS:	50.5278	103.66347

Comments: 1999: Weevils were released by transformer. The areas was mowed in the spring and sprayed with Ally in the spring of 1999. 2002: Looks like a perennial plant, weevils on plants along CPR, release site. Photo 2002 P3 - 016, 017, 018. 120 found in 30 min. 2003: 47 found in 20 min. 2003 P1 - 019. 2004: 2004 P4 - 012. GPS1 WP189.

RM 157	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 08-19-16 W2	9-Jun-00	60		2003	7	
SK-00-152				2005	8	
Contact Person:		Phone #:		GPS:	50.59469	104.17687

Comments: 2000: Requested by Mike Champion, Ducks Unlimited. 2003: Area sampled. 2003 P3 - 004. 2005: Plants south of slough. GPS2 WP420.

RM 157	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 9-18-16 W2	1-Sep-95	500	0-20	1997		0
SK-95-037				1999	4	
				2002	0	
Contact Person:		Phone #:		GPS:	50.50655	104.1562

Comments: 1999: Released in a low area, the weevils have moved to the field edge by the trees. 2002: Site along the highway ROW, GPS reading could be incorrect. GPS1 WP190.

RM 157	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 6-20-18 W2	1-Sep-95	500	0-20	1997		0
SK-95-038				1999	0	
				2005	61	
Contact Person:		Phone #:		GPS:	50.65928	104.47692

Comments: 1999: The release site is a wet area by a nearby field of alfalfa. 2005: Scentless chamomile plants growing on rodent disturbed areas. 2005 P4 - 009. GPS1 WP191.

RM 157	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 18-18-15 W2	1-Sep-95	500	0-20	1997		0
SK-95-039						

Contact Person: Phone #: GPS: 50.5169 104.0566 Cal

Comments:

RM 157	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 28-18-14 W2	1-Sep-95	500	0-20	1997		0
SK-95-041				1999	154	53
				2000	243	55
				2002	565	
				2003	131	

Contact Person: Phone #: GPS: 50.54684 103.87364 Cal

Comments: 1999: Qu'Appelle site. Weevils are along the road, moving south. 2002: Close up, best area for weevils. Phot 2002 P3 - 021, 022. 565 found in 15 min. 2003: 131 in 10 min. 2003 P1 - 016, 017 GPS1 WPAA10.

RM 157	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 18-18-15 W2	1-Sep-95	500	20-35	1999	10	39
SK-95-042				2000		52
				2002	77	
				2003	23	
				2004	25	

Contact Person: Phone #: GPS: 50.51637 104.05695 Cal

Comments: 1999: Released by fence, moved around to the side of the fence. Wood Country is aware of the weed and is controlling it. 2002: Lumber yard, plant in drainage ditch, area and ditch. Photo 2002 P3 - 023, 024, 025. 77 found in 15 min. 2003: 23 found in 10 min. 2003 P1 - 020, 021, 022. 2004: 25 found in 15 min. 2004 P11 - 010. GPS1 WPAA11.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 30-19-18 W2	7-Sep-95	500	0-20	1996	0	
SK-95-025				2003	0	
				2004	0	
				2005	2	

Contact Person: Phone #: GPS: 50.63584 104.48117

Comments: 1996: No scentless chamomile at the release stake. Area may have been flooded. 1999: Entrance road flooded, did not sample. 2003: No scentless chamomile plants. 2004: No plants, cultivation in to grass. 2004 P7 - 013. 2005: Scentless chamomile plants at the edge of a lentil field. 2005 P4 - 010. GPS2 WP418.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 5-20-18 W2	1-Sep-95	500	0-20	1996	2	
SK-95-027				1999	0	
				2003	32	
				2004	0	

Contact Person: Phone #: GPS: 50.65928 104.47692

Comments: 1996: Very wet area, good weed stand. 1999: Very few plants to search, site failed. Weevils may have moved to adjacent 2 quarter sections with solid stands of scentless chamomile. 2003: Plant with 9 weevils, plant with 10 weevils, view from release post. 32 found in 20 Min. 2003 P2 - 024, 025, 026. 2004: Very few plants, close to GPS1 WP191. 2004 P7 - 006, 007, 008. GPS1 WP192.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 4-20-18 W2	7-Sep-95	500	0-20	1996	0	
SK-95-028				1999	0	
				2003	3	
				2004	0	
				2005	0	

Contact Person: Phone #: GPS: 50.66035 104.44698

Comments: 1996: Stake submerged in water, possible flooded out. 1999: No scentless chamomile at release site, site failed. Very few plants, mostly on old burrowing animal mounts. 2003 3 found in 15 min. P2 - 001, 002. 2004: No scentless chamomile plants. 2004 P7 - 004. 2005: Only 5 plants. Field seeded to grass-alfalfa. 2005 P4 - 013, 014. GPS2 WP415.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE/NW 33-19-18 W2	7-Sep-95	500	0-20	1996	0	
SK-95-029				1999	2	
				2004	0	
				2005	66	

Contact Person: Phone #: GPS: 50.65854 104.44309

Comments: 1996: Release stake submerged in water. 1999: could not find the release stake, field had been hayed. 2003: In photo, perennial plant no controlled in direct seeded field. 2003 P2 - 003, 004. 2004: No scentless chamomile plants. 2004 P7 - 005. 2005: Scentless chamomile plants growing on rodent made disturbance. Most weevils along field edge. 2005P4 - 015, 016. GPS2 WP414.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 18-20-17 W2	7-Sep-95	500	0-20	1996	0	
SK-95-030				2003	34	
				2004	28	
				2005	82	

Contact Person: Phone #: GPS: 50.69755 104.35907

Comments: 1996: Stake submerged in 2' of water. Site destroyed. 2003: Scentless chamomile on field edge. 2003 P2 - 006. 2004: Few winter annuals, many spring annuals. 2004 P7 - 016. 2005: GPS2 WP413.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NE 4-20-17 W2	1-Sep-95	500	0-20	1996	0		
SK-95-031				2003	5		
Contact Person:			Phone #:		GPS:	50.6719	104.29397

Comments: 1996: No scentless chamomile within 5 m of the stake. 1999: could not find the release stake, site lost. 2005: Too wet to sample. GPS2 WP412.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 36-19-17 W2	7-Sep-95	500	0-20	1996	3		
SK-95-033				1999	6		
				2002	126		
				2003	76		
				2004	6		
				2005	140		
Contact Person:			Phone #:		GPS:	50.65067	104.22425

Comments: 1996: Small scentless chamomile stand, possible chemical damage. 2002: Photo 2002 P2 - 020, 021. 126 found in 30 min. Plants with weevils. 2003: Scentless chamomile along field edge-grassland, weevils on plants well within the grassland. 2003 P2 - 014, 015. 76 found in 20 min. 2004: 6 found in 5 min. 2004 P11 - 009. 2005: Along the field edge. 2005 P2 - 022, 023. GPS1 WP196.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 16-19-17 W2	6-Sep-96	500	0-20	1999	9		
SK-96-001				2002	119		
				2003	51		
				2004	3		
				2005	7		
Contact Person:			Phone #:		GPS:	50.60158	104.31622

Comments: 1999: Little scentless chamomile at original site. Weevils moved across the road. 2002: Photo 2002 P2 - 009, 010, 011, 012, 013, 014, 015. 119 found in 30 min. 2003: Photo of plants with weevils, a disturbed area in ROW and at the field entrance. 51 found in 20 min. 2003 P2 - 011, 012. 2004: Very few scentless chamomile plants. 2004 P7 - 014. 2005: Few plants at release site, many plants across the ROW. 2005 P2 - 021. GPS1 WP197.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 6-20-18 W2	6-Sep-96	500	0-20	1999	3		
SK-96-002				2003	170		
				2004	33		
				2005	0		
Contact Person:			Phone #:		GPS:	50.65949	104.48058

Comments: 1999: Release site is covered with quack grass and the weevils have moved to a nearby large field. 2003: Four weevils in a head, plants with 72 weevils in disturbed area. 2003 P2 - 020, 021. 2004: 2004 P7 - 009, 010. 2005: Scentless chamomile plants growing on rodent disturbed areas. Looks like an abandoned field. 2005 P4 - 006, 007, 008. GPS2 WP416.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 30-19-18 W2	30-Aug-96	500	0-20	2003	183	
SK-96-003				2004	0	
				2005	1	
Contact Person:		Phone #:		GPS:	50.63571	104.48046

Comments: 1999: Entrance road was to wet, did not sample. 2003: Slough with scentless chamomile and weevils, patch with 123 weevils. 2003 P - 022, 023. 2004: Cultivation delayed plants, few plants. 2004 P7 - 012. 2005: Scentless chamomile plants at the edge of a lentil field. 2005 P4 - 011. GPS2 WP419.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 18-20-17 W2	6-Sep-96	500	>35	1999	1	
				2002	89	
SK-96-004				2003	159	
				2005	93	
Contact Person:		Phone #:		GPS:	50.69943	104.36068 Cal

Comments: 1999: No scentless chamomile at the release point. Weevils have moved to the shelterbelt. 2002: Site photo. 2002 P3 - 003. 2003: In photo, plants on right have weevils, not many plants on the left, not many plants have weevils, Roundup damage. 2003 P2 - 007. 2005: Shelter belt good site for scentless chamomile and weevils. 2005 P3 - 004. GPS1 WP199.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 18-20-17 W2	6-Sep-96	500	0-20	1999	24	27
SK-96-005				2000		91
				2002	165	
				2003	63	
				2004	92	
				2005	576	
Contact Person:		Phone #:		GPS:	50.68923	104.36143

Comments: 1999: Original patch has disappeared. Weevils have moved across the road. 2002: 165 found in 30 min. Edge 2, lake no scentless chamomile, solid scentless chamomile 1999. Photo 2002 P2 - 024, 025. 2003: Field of scentless chamomile. 2003 P2 - 005. 2004: Land not worked in 2004. 2004 P5 - 015. 2005: Seed head photo, scentless chamomile in ROW. 2005 P2 - 025, P3 - 001, 002, 003. GPS1 WPAA13.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 19-20-18 W2	6-Sep-96	500	0-20			
SK-96-006						
Contact Person:		Phone #:		GPS:	50.706	104.4873 Cal

Comments: 1999: Entrance road in was wet, did not sample.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 2-20-17 W2	6-Sep-96	500	20-35	1999	20	0
SK-96-007				2000		0
				2002	6	
				2003	57	
				2004	15	
				2005		

Contact Person: Phone #: GPS: 50.64968 104.24712

Comments: 2000: Could find only 8 seed heads to sample. 2002: Scentless chamomile in slough, edge of crop-brome. Photo 2002 P2 - 018, 019. 6 found in 30 min. 2003: 57 found in 10 min. Weevils on plants at the edge of sprayed slough, no scentless chamomile plants in ROW. 2003 P2 - 013. 2004: Scentless chamomile with weevils only on the ROW shoulder. 2004 P11 - 008. 2005: Scentless chamomile plants are not in the bud stage. GPS1 WPAA14.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 25-18-18 W2	30-Aug-96	500	>35	1999	0	
SK-96-008				2000	3	
				2003	5	
				2004	0	
				2005	0	

Contact Person: Phone #: GPS: 50.55625 104.36318

Comments: 1999: No scentless chamomile. The site has been cleaned up. 2002: 3 found in 30 min on a few scentless chamomile plants in a yard were the farmer is trying to pick all plants. 2003: Weevils in shelter belt to the east. 2004: On June 30, lots of stems with shoots showing. 2005: Soil to wet to search for weevils in main area some plant under water. GPS1 WP200.

RM 158	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 8-19-18 W2	26-Aug-96	500	0-20	1999	6	
SK-96-009				2002	215	
				2003	245	
				2004	56	
				2005	38	

Contact Person: Phone #: GPS: 50.59918 104.45563

Comments: 1999: Weevils have moved across the road. 2002: Scentless chamomile along field edge, on scentless chamomile with cattails. Photo 2002 P3 - 004, 005. 215 found in 15 min. 2003: Photos, scentless chamomile around field and plant in slough. 2003 P1 - 023, 024. 2004: weevils along field edge by bins and around slough. 2004 P6 - 025. 2005: Scentless chamomile in bud stage. 2005 P2 - 008. GPS1 WP201.

RM **158**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 23-18-18 W2	30-Aug-96	500	0-20	1999	1	
SK-96-010				2002	5	
				2003	0	
				2004	0	
				2005	0	

Contact Person: Phone #: GPS: 50.54235 104.38105

Comments: 1999: Large area with scentless chamomile nearby. 2002: No weevils on road shoulder, weevils in ROW, scentless chamomile in grass and grass-alfalfa pasture. Photo 2002 P2 - 004, 005, 006. 5 found in 30 min on scentless chamomile plants in the ditch. 2003: No scentless chamomile in ROW, no weevils on plants in pasture. 2003 P2 - 010. 2004: Early rotational grazing was grazing scentless chamomile. No scentless chamomile plants in ROW. Scentless chamomile plants in pasture. 2004 P11 - 003, 004, 005. 2005: Scentless chamomile only in pasture, in first flower. GPS1 WP203.

RM **184**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 10-20-4 W2	1995			1999	106	
SK-95-?						

Contact Person: Phone #: GPS: 50.70884 102.47565

Comments: 1999: Released by a rock, area was cultivated but the weevils have moved over the area. GPS1 WP202.

RM **186**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 2-21-12 W2	1995			1999	11	
SK-95-004				2002	70	

Contact Person: Phone #: GPS: 50.76805 103.58237

Comments: 1999: An isolated area, a waterway with scentless chamomile growing in four small patches. 2002: Release site, 8 plants, weevils on plants on the other side of road. Photo 2002 P3 - 019. 70 found in 30 min. GPS1 WPAA12.

RM **187**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 36-20-17 W2	1-Sep-95	500	0-20	1996	0	
SK-95-032				1999	0	
				2002	3	
				2003	6	
				2005		

Contact Person: Phone #: GPS: 50.73787 104.22301 Cal

Comments: 1996: Stake submerged in water, possible spring flooded out. 1999: scentless chamomile present, could not locate release stake, site lost. 2002: Weevils on cattails, field edge. Photo 2002 P2 - 022, 023. 3 found in 30 min. 2003: 6 found in 15 min. Slough ploughed up, no plants in wooded area. A few plants along the edge. 2003 P2 - 008. 2005: Site too wet to sample, 56 weevils on scentless chamomile plants at entrance to the site 1 km away. 2005 P2 - 024. GPS1 WP195.

RM 189	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 35-19-19 W2 SK-95-026	7-Sep-95	500	0-20	1996	2		
				2003	132		
				2004	94		
				2005	221		
Contact Person:			Phone #:		GPS:	50.6587	104.54201
Comments: 1999: Could not find the release point, did not sample, site lost. 2003: Road shoulder cut, plants with weevils beyond cut, slough with lots of weevils, few weevils with herbicide control. 132 found in 20 min. 2003 P2 - 016, 017, 018, 019. 2004: Along the edge of a ROW. 2004 P7 - 011. 2005: Good slough site with weevils. 2005 P4 - 001, 002, 003, 004. GPS2 WP417.							

RM 190	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 24-21-23 W2 SK-95-045	3-Jul-95	500	20-35	1997		0	
				1998		0	
				1999	0	5	
Contact Person:	Doug Patience		Phone #:	638-4967	GPS:	50.79213	105.07791
Comments: 1999: Very little scentless chamomile at release site but scentless chamomile is nearby. GPS1 WP205.							

RM 190	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 24-21-23 W2 SK-96-065	29-Aug-96	500	20-35	1999	0		
Contact Person:	Doug Patience		Phone #:	638-4967	GPS:	50.7933	105.0531 Cal
Comments: 1999: Scentless chamomile disappeared from the site. Competitive grass.							

RM 213	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 12-24-2 W2 SK-96-073	30-Aug-96	500	20-35	1999	0		
				2002	28		
				2005	152		
Contact Person:			Phone #:		GPS:	51.05578	102.15817
Comments: 1996: Released by Wendy Schatz around the land fill site north of Saltcoats. 2002: Site photo 2002 P1 - 20. 28 found in 30 min. 2005: Most weevils between fence and garbage, undisturbed site. 2005 P2 - 011, 012. GPS1 WP178.							

RM 214	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 11-12-5 W2 SK-95-?	1995			1999	55		
				2002	33		
				2005	0		
Contact Person:			Phone #:		GPS:	50.88318	102.59823
Comments: 1999: Released on a hill, no scentless chamomile but weevils are moving along the field edge. Some weevils are on scentless chamomile growing in shade. 2002: Photo 2002 P1 - 25. 33 found in 10 min. 2005: To wet to get to release site. GPS1 WPAA05.							

RM **214**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 12-22-5 W2	1995			1999	43		
SK-95-?				2002	146		
				2005	0		
Contact Person:			Phone #:		GPS:	50.8828	102.58349

Comments: 1999: Released on island in slough, near field, weevils have moved along the south edge of the slough. 2002: Photo 2002 P1 - 022, 023, 024. 146 found in 10 min. 2005: No plants crop to water edge. 2005 P2 - 010. GPS1 WPAA04.

RM **218**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 18-23-16 W2	5-Jun-01	60	*****	*****	*****	*****	
SK-01-164							
Contact Person:			Phone #:		GPS:	50.9533	104.2153 Cal

Comments: The site is at the north end of the yard site.

RM **221**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 29-23-24 W2	1-Aug-95	500	20-35	1996	0		
SK-95-046				1997		5	
				1998		3	
				1999	1	9	
				2000		17	
Contact Person:	Doug Patience		Phone #:	638-4967	GPS:	49.56776	106.77967

Comments: 1999: Search the area around the high water. GPS1 WP174.

RM **221**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 29-23-24 W2	29-Aug-96	500	>35	1997		0	
SK-96-066				1998		2	
				1999	0	0.5	
Contact Person:	Doug Patience		Phone #:	638-4967	GPS:	50.98912	105.32543

Comments: 1999: Could be a high spring water. Looks like herbicide damage on the plants. GPS1 WP182.

RM **243**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 31-25-3 W2	30-Aug-96	500	>35	1997		1	
SK-96-074				1999	1		
				2002	121		
				2005	244		
Contact Person:			Phone #:		GPS:	51.20511	102.4202

Comments: 1996: Released by Wendy Schatz. 1999: Released at the pile of soil at the east end of Yorkton. 2002: Photo 2002 P1 - 019. 121 found in 30 min. 2005: Scentless chamomile in first open flower stage. 2005 P2 - 009. GPS1 WP177.

RM **253**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 12-24-29 W2	2001	60	0-20				
SK-01-160							
Contact Person:			Phone #:		GPS:	51.0261	105.9133 Cal

Comments: Landowner: Al Maier 734-2493. By a slough which the owner has sprayed for a number of years.

RM 277	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 13-29-14 W2	1-Sep-95	500	20-35	1999	24	23
SK-95-001				2000		55

Contact Person: Phone #: GPS: 51.50522 103.86198

Comments: 1999: Release by the sign at the land fill. GPS1 WPAA03.

RM 278	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
*****	12-Aug-03	400	*****	*****	*****	*****
SK-03-192						

Contact Person: Gottlieb Kreitzer Phone #: 835-2560 GPS:

Comments: Released in an old yard.

RM 301	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 32-31-31 W1	17-Jun-99	60	20-35			
SK-99-109						

Contact Person: Phone #: GPS: 51.7027 101.8209 Cal

Comments: Released in an area with scentless chamomile along a field margin and roadside.

RM 307	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 12-32-13 W2	12-Aug-03	400	*****	*****	*****	*****
SK-03-193						

Contact Person: Garry Bowes Phone #: 933-7695 GPS: 51.73064 103.71095

Comments: Landowner SK Highways, Brian Jansen. Release in an old gravel pit. 2003: Site photo. 2003 P12 - 022. GPS2 WP430.

RM 307	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 12-32-13 W2	12-Aug-03	400	*****	*****	*****	*****
SK-03-194						

Contact Person: Garry Bowes Phone #: 933-7695 GPS: 51.73126 103.71158

Comments: Landowner SK Highways, Brian Jansen. Release in an old gravel pit. 2003: Site photo. 2003 P12 - 023. GPS2 WP431.

RM 307	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 12-32-13 W2	12-Aug-03	400	*****	*****	*****	*****
SK-03-195						

Contact Person: Garry Bowes Phone #: 933-7695 GPS: 51.73095 103.7117

Comments: Landowner SK Highways, Brian Jansen. Release in an old gravel pit. 2003: Site photo. 2003 P12 - 024. GPS2 WP432.

RM 307	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 12-32-13 W2	12-Aug-03	400	*****	*****	*****	*****
SK-03-196						

Contact Person: Garry Bowes Phone #: 933-7695 GPS: 51.73042 103.71065

Comments: Landowner SK Highways, Brian Jansen. Release in an old gravel pit. 2003: Site photo. 2003 P12 - 025. GPS2 WP433.

RM 307	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 27-31-15 W2	24-Aug-95	500	>35	1999	0		
SK-95-002				2002	0		
Contact Person:			Phone #:		GPS:	51.68995	104.05964

Comments: 1995: Site may be prone to flooding. 2002: Field farmed close to slough. Road ROW cleared by bull dozer. GPS1 WP179.

RM 308	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 2-31-17 W2	1-Aug-95	500	20-35	2002	0		
SK-95-003							
Contact Person:	G J Kreitzer		Phone #:	835-2580	GPS:	51.62263	104.29672 Cal

Comments: 2002: Grass site with very few scentless chamomile plants. GPS1 WP181.

RM 308	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 12-31-18 W2	1996			1999	6		
SK-96-?				2002	6		
Contact Person:			Phone #:		GPS:	51.63852	104.4385

Comments: 1999: Released by rock. 2002: Weevils found on banks of dugout. Photo 2002 P2 - 001, 002, 003. 6 found an 30 min along the banks of the dugout. GPS1 WP180.

RM 320	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NE 18-32-22 W3	18-Jun-99	60	0-20				
SK-99-104							
Contact Person:			Phone #:		GPS:	51.7463	109.0996 Cal

Comments: Released in the yard adjacent to a school yard.

RM 336	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 22-36-12 W2	29-Aug-95	500	>35				
SK-95-008							
Contact Person:			Phone #:		GPS:	52.1101	103.6362 Cal

Comments: 1999: Did not sample, site lost.

RM 337	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 27-36-14 W2	1-Sep-95	500	>35				
SK-95-007							
Contact Person:			Phone #:		GPS:	52.1174	103.9218 Cal

Comments: 1999: Did not sample, site lost.

RM 338	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Samples Collected	% Stems Infested	
SE 10-34-16 W2	7-Jun-00	60	>35				
SK-00-155							
Contact Person:			Phone #:		GPS:	51.8992	104.1786 Cal

Comments: 2000: Edge of old yard, 50' west of the old house.

RM 339	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NW 15-34-20 W2	17-Jun-99	60	20-35	2002	0	
SK-99-119						

Contact Person: Phone #: GPS: 51.9239 104.76326

Comments: Insects in poor condition when released. 2002: Each year scentless chamomile plants were pulled, so no plants. GPS1 WP131.

RM 340	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 10-36-22 W2	17-Jun-99	60	20-35			
SK-99-120						

Contact Person: Phone #: GPS: 52.081 105.0524 Cal

Comments: Insects in poor condition when released. By 2001 the scentless chamomile plants were controlled because of the nearby water run.

RM 341	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 28-32-26 W2	2001	60	0-20			
SK-01-172						

Contact Person: Russ Deneiko Phone #: 259-4927 GPS: 51.7725 105.6191 Cal

Comments: Landowner: Saskatchewan Water 946-3200. Released on a road right-of-way near a water canal on the SW corner.

RM 341	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 27-32-25 W2	15-Jun-01	60	0 to 20			
SK-01-179						

Contact Person: Ivan Allin Phone #: 946-2440 GPS: 51.7682 105.4658 Cal

Comments: 2001: Site is located on road right-of-way, NW corner of the section.

RM 346	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 24-34-12 W3	18-Jun-99	60	0-20			
SK-99-101						

Contact Person: Phone #: GPS: 51.9356 107.5646 Cal

Comments: Abandoned railway right-of-way.

RM 346	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 24-34-12 W3	19-Jun-00	60				
SK-00-156						

Contact Person: Phone #: GPS: 51.9356 107.5646 Cal

Comments:

RM **352**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 34-35-26 W3	17-Jun-99	59	0-20	2000	0		
SK-99-115				2003	0		
				2004	0		
Contact Person:			Phone #:		GPS:	52.05557	109.64156

Comments: 1999: Released on the edge of a field. 2000: A site by a slough. Grass surrounded the area around the stake. 2004: Monitored all of the plants in 20 min. Appears to be a good site for a release. 2004 P13 - 006, 007, 008, 009, 010. GPS1 WP075.

RM **366**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 17-37-11 W2	15-Sep-95	500	>35				
SK-95-009							
Contact Person:			Phone #:		GPS:	52.1756	103.541 Cal

Comments: 1999: Did not sample, site lost.

RM **381**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 10-37-24 W3	17-Jun-99	59	0-20	2000	9		
SK-99-114				2003	0		
				2004	0		
Contact Person:			Phone #:		GPS:	52.17253	109.34991

Comments: 1999: Released in a abandoned yard. 2000: In a ditch, roadside was sprayed with dicamba. 2004: No scentless chamomile plants. Farmer and RM are picking scentless chamomile plants. 2004 P13 - 020, 021. GPS1 WP073.

RM **427**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NE 25-45-15 W2	24-Aug-95	500	>35	1996	0		
SK-95-017				1997		17	
				1999	119	95	
				2000	78	71	
				2002	51		
Contact Person:			Phone #:		GPS:	52.91452	104.04773

Comments: 2000: No scentless chamomile by the stake, the weevils have moved to the west and around the grove of trees. 2002: Photo 2002 P1 - 011,012. 51 found in 10 min. GPS1 WP047.

RM **427**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
NW 25-45-15 W2	14-Aug-95	500	>35	1996	0		
SK-95-018				1997		3	
				1999	7		
				2000	0		
				2002	28		
Contact Person:			Phone #:		GPS:	52.84097	103.84252

Comments: 2000: Acres of alfalfa nearby with some scentless chamomile. 2002: 14 weevils found on 18 plants in 30 min. GPS1 WPAA018.

RM **427**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 36-45-15 W2	4-Sep-96	500	>35	1997		6
SK-96-063				1997	14	41
				2000	68	83
				2002	68	
Contact Person:		Phone #:		GPS:	52.92261	104.03875

Comments: 2000: Yard around the release site is cleaned up. Weevils have moved by the dugout, some east to the field and by the wood pile. 2002: Photo 2002 P1 - 013. 68 found in 10 min. GPS1 WPAA02.

RM **427**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 25-45-15 W2	8-Sep-96	500	>35	1997		0
SK-96-064						
Contact Person:		Phone #:		GPS:	52.9104	104.0372 Cal

Comments:

RM **435**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 4-45-10 W3	1997			1999		
SK-97-0003						
Contact Person:		Phone #:		GPS:	52.8449	107.3844 Cal

Comments: Could not find the release point along the roadside. Site lost.

RM **435**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 4-45-10 W3	1997			1999		
SK-97-0004						
Contact Person:		Phone #:		GPS:	52.8449	107.3844 Cal

Comments: Could not find the release point along the roadside. Good grass competition and no scentless chamomile. Site lost.

RM **435**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 18-45-10 W3	1996			1999	>1	
SK-96-075-1						
Contact Person:		Phone #:		GPS:	52.87275	107.43463

Comments: 1999: Found the yellow post, a Ducks Unlimited site. Excellent forage establishment and no scentless chamomile. Site destroyed. GPS1 WP051.

RM **457**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 15-48-14 W2	24-Aug-95	500	>35	1996	0	
SK-95-019				1999	8	
				2000	2	
				2002	143	
Contact Person:		Phone #:		GPS:	53.13288	103.96454

Comments: Again lots black-fingernail clipping insects on flowers. Wasps and honey bees located approximately 0.4 km away. 2002: Weevils on 12 plants. Photo 2002 P1 - 015, 016, 017, 018. on the north side of the slough and into the slough from the west. 2002: 143 found in 15 min. GPS1 WPAA019.

RM 457	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 30-48-13 W2	14-Sep-95	500	20-35	1997		6	
SK-95-062				1999		9	
Contact Person:			Phone #:		GPS:	53.165	103.8829 Cal
Comments:							

RM 457	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 30-48-13 W2	6-Sep-96	500	>35	1997		6	
SK-96-062				1999	9		
				2000	5		
				2002	9		
Contact Person:			Phone #:		GPS:	53.11708	103.95863
Comments: 2000: In the chemical/fertilizer/seed dealers yard by trees and to the east. 2002: Found growing around bins. Photo 2002 P1 - 014. 9 found in 10 min. GPS1 WPAA026.							

RM 457	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 36-46-13 W2	18-Jun-99	60	0-20				
SK-99-118							
Contact Person:			Phone #:		GPS:	53.005	103.7471 Cal
Comments: Release on an organic farm. has digital pictures.							

RM 466	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 18-48-10 W3	1996			1999			
SK-96-075-2							
Contact Person:			Phone #:		GPS:	52.87153	107.4349
Comments: 1999: Found the release point, a yellow electric fence post. Excellent forage stand and no scentless chamomile at the release point. Weevils were present at a slough 150-200 ft away. GPS1 WP053.							

RM 487	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SW 18-50-14 W2	10-Sep-96	500	>35	1999	0		
SK-96-076				2000	0		
				2002	0		
Contact Person:			Phone #:		GPS:	53.30831	104.0495
Comments: 1999: Site failed, reason unknown. 2000: Brome and quack grass moved into the release site, scentless chamomile has disappeared and no evidence that the weevils have moved to a new area. 2002: No scentless chamomile plants were found at the release site. GPS1 WP041.							

RM 487	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested	
SE 13-50-15 W2	18-Jun-99	60	20-35	2002	63		
SK-99-112							
Contact Person:			Phone #:		GPS:	53.30807	104.05537
Comments: Released in an old gravel stock pile area. Near Microplontus release site. No assessment taken in 2000. 2002: 63 found in 15 min. Grasses and maples moving in. GPS1 WP052.							

RM 487	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 13-50-15 W2	9-Jun-00	60		2002	47	
SK-00-158						

Contact Person: Phone #: GPS: 49.59889 -108.86879

Comments: 2002: 47 found in 15 min. GPS1 WP151.

RM 487	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 13-50-15 W2	*****	*****	*****	2002	73	
*****						

Contact Person: Phone #: GPS: 49.61697 108.88155

Comments: 2002: 73 found in 15 min. GPS1 WP152.

RM 494	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 34-51-4 W3	31-Aug-95	500	20-35	1997		1
SK-95-047				1999	78	51
				2000	160	41
				2002	49	
				2003	94	
				2004	23	

Contact Person: Phone #: GPS: 53.44168 106.49878

Comments: Landowner, Lawrence Kvinlaug 468-2627 2002: 49 found in 30 min. 2003: 94 found in 30 min. 2003 P1 - 014, 015 2004: 2004 P19 - 005. GPS1 WPAA16.

RM 494	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 28-51-5 W3	31-Aug-95	500	20-35	1999	3	
SK-95-048				2002	0	
				2004	0	

Contact Person: Phone #: GPS: 53.41377 106.59419

Comments: 1999: Released along the roadside. 2002: No scentless chamomile plants were found. 2004: In 10 minutes, search all of the plants. Scentless chamomile plants grew near animal mounds. 2004 P19 - 016. GPS1 WP148.

RM 494	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SW 30-52-4 W3	31-Aug-95	500	0-20	1999	1	
SK-95-049				2002	23	
				2004	115	

Contact Person: Phone #: GPS: 53.51017 106.58157

Comments: 1999: Release was in the middle of the right-of-way of the road. 2002: 23 found in 30 min in old mounds of soil dug by animals. 2004: Three galls in the area. 2004 P19 - 013, 014, 015. GPS1 WP224.

RM **494**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 2-51-5 W3 SK-95-050	31-Aug-95	500	20-35	1997		23
				1999	7	
				2000	158	
				2002	151	
				2004	17	

Contact Person: Phone #: GPS: 53.36586 106.62538

Comments: A disturbed site in a ditch, a culvert was removed. 2002: 151 found in 30 min. 2004: 2004 P19 - 018. GPS1 WP008.

RM **494**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
SE 21-51-5 W3				2000	4	
				2004	27	

Contact Person: Phone #: GPS: 53.41525 106.66878

Comments: 2000: Adjacent field sprayed with Roundup. 4 found in 15 min. 2004: Three galls in the area. 2004 P19 - 017. GPS1 WP223.

RM **494**	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Adult # Found	% Heads Infested
NE 19-52-4 W3				2000	16	

Contact Person: Phone #: GPS: 53.5069 106.5713 Cal

Comments: 2000: Adjacent field sprayed with Roundup. 16 found in 15 min.

Table 2. List of Release Sites for Scentless Chamomile Gall Midges

RM 31	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SW 23-6-31 W1	22-Aug-01	9			
SK-01-R-026					

Contact Person: Del Chicoine Phone #: 449-2262 GPS: 49.4899 101.5592 Cal

Comments: Landowner: Leon Magotiaux 452-6193.

RM 78	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
ED					
SW 17-8-18 W3	*****	12	2005	Yes	1
SK-			2004	Yes	10
			2005	Yes	10

Contact Person: Garry Bowes Phone #: 933-7695 GPS: 49.64649 108.40733

Comments: Released behind the Crop Insurance Building in Shaunovan. 2005: 2005 P13 - 022, 023. GPS2 WP426.

RM 78	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 16-08-18 W3	3-Oct-02	12	2003	Yes	3
SK-02-R-050			2004	Yes	10
			2005	Yes	10

Contact Person: Phone #: GPS: 49.64686 108.38929

Comments: Requested by Ray Dawson, 297-3819. Released in a pasture. 2003: New owner P. Milleaux. Gall and site. 2003 P4 - 015, 016. 2004: Buffalo pasture. 2004 P15 - 011, 012, 013, 014, 015 (scentless chamomile by junk). 2005: 2005 P13 - 020, 021 GPS2 WP422.

RM 78	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
N 08-08-18 W3	3-Oct-02	12	2003	No	0
SK-02-R-041			2004	No	0

Contact Person: Phone #: GPS: 49.63579 108.40945

Comments: Landowner; Vern Mellor, 297-2824. Released in disturbed area of a pasture. 2003: Photo 2003 P4 - 011. 2004: Very few plants. 2004: P15 - 009, 010. 2005 Buffalo in pasture not monitored. GPS2 WP421.

RM 78	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 07-08-18 W3	26-May-03	12	2003	No	0
SK-03-R-055			2004	Yes	10
			2005	Yes	10

Contact Person: Phone #: GPS: 49.62687 108.42318

Comments: Landowner Ben Vause, 297-3910. 2003: Spring release, monitored on July 15, 2003. Site photo. 2003 P4 - 017. 2004: 2004 P15 - 005, 006, 007, 008 (New Holland). 2005: 2005 P13 - 019. GPS2 WP423.

RM 79	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
NE 30-07-19 W3	26-May-03	12	2003	Yes	6	
SK-03-R-056			2004	Yes	10	
Contact Person:		Phone #:		GPS:	49.5931	108.56836

Comments: Landowner Vince Stevenson, 297-3059, spring release. 2003: Site photo. 2003 P4 - 020, 021. 2004: Scentless chamomile in a pasture. 2004 P15 - 025, P16 - 001, 002, 003, 004, 005 ,006, 007, 008, 009 (0.5 km from release), 010 (1 km from release). 2005: Water hole dried up, walk over .83km, found 6 plants in pasture with galls. 2005 P13 - 014, 015. GPS2 WP425.

RM 79	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
NE 09-09-20 W3	3-Oct-02	12	2003	Yes	10	
SK-02-R-046			2004	Yes	10	
			2005	Yes	10	
Contact Person:		Phone #:		GPS:	49.7245	108.65112

Comments: Requested by Earl Duncan, 297-2002. Release on scentless chamomile on hay land. 2003: Photo, site and gall. 2003 P4 - 018, 019. 2004: Galls are on scentless chamomile plants below the cut line. 2004 P17 - 001, 002, 003, 004. 2005: few scentless chamomile plants, lots of galls for the number of plants. 2005 P13 - 014, 015. GPS2 WP424.

RM 79	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
NE 35-7-20 W3	17-Jun-99	25	2000	Yes	10^+	
SK-99-R-003			2001	Yes	10^+	
			2002	Yes	10	
			2003	Yes	10^+	
			2004	Yes	10^+	
			2005	Yes	10^+	
Contact Person:	T. Lennox	Phone #:	778-8294	GPS:	49.60532	108.6084

Comments: 1999: Released around a drainage ditch with saline soil. 2000: On July 10, the site was to wet to monitor. The site was revisited on September 20 and 10 galls were found in 10 min. 2001: Very few winter annual plant. All plants found had galls. Evidence of galls on dead summer annual plants. Area flooded, winter annual scentless chamomile plants found in grassland near the disturbance caused by cattle. 2002: Area (2), close up, area, old gall, close up (2), area. Photo 2002 P12 - 001, 002, 003, 004, 005, 006, 007, 008. 2003: Site, lots of galls. 2003: P4 - 012,013,014. 2004: Close ups, each photos has at least 5 galls. 2004 P15 - 016, 017, 018, 019, 020, 021, 022, 023, 024. 2005: No scentless chamomile by slough, lots of old galls on dead spring scentless chamomile plants. 2005 P13 - 016, 017. GPS1 WP114

RM 98	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
SW 18-11-16 W2	23-Aug-01	9	2002			
SK-01-R-030						
Contact Person:		Phone #:		GPS:	49.9057	104.1781 Cal

Comments: Landowner: Fred McClinton, farmed by Lorne McClinton 465-2549. Plants located on west end of dirt pile adjacent to road and drainage ditch. 2002: Could not find the site. Waypoint marks a point but the site has been cultivated. GBP2 WP406.

RM **98**	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 23-11-17 W2	17-Jun-99	25	2000	Yes	1
SK-99-R-004			2001	Yes	10^+
			2002	No	0
			2003	Yes	10
			2004	No	0
			2005	No	0
Contact Person:		Phone #:		GPS:	49.93054 104.22469

Comments: Also contact person, Ray Beck. Agriculture Fieldworker for RM #98. Released the edge of an 80 acre field by the pole in a line to the north, adjacent to the "Yellow Grass Main" drainage ditch. Field was treated with Roundup in fall of 1999, Roundup in spring of 2000 and an in crop herbicide was applied. Field to the east was cultivated twice in the fall, plus a fall Roundup treatment. The in crop herbicide was Buctril M. 2001: Area was fall mowed. Galls were found below the mowed layer. No winter annual scentless chamomile plants were found. 2003: Site, gall, good control in field with scentless chamomile at field edge, 4 galls in small area. 2003 P3 - 021, 022, 023, 024. 2004: 2004 P11 - 011, 012. 2005: Dry, no rosettes except in field. 2005 P14 - 001, 002, 003, 004, 005. GPS1 WP120.

RM **98**	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 24-11-17 W2	9-Jun-00	5	2000	Yes	4
SK-00-R-009			2001	Yes	10^+
			2002	No	0
			2003	No	0
			2004	No	0
			2005	No	0
Contact Person:		Phone #:		GPS:	49.93055 104.19855

Comments: Site by abandoned dugout. Some of the roadside was mowed. The mower passed over some of the plants with galls. Land owned by Brian Dreger. Scentless chamomile is around the landfill and the gall midges have moved to the east site. Could not find any winter annual scentless chamomile plants, suspect grasshoppers. 2004: No galls in 15 minutes, no more plants to monitor. 2005: 2005 P14 - 006. GPS1 WP121.

RM **98**	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NW 25-11-17 W2	9-Jun-00	13	2000	Yes	10^+
SK-00-R-010			2001	Yes	10^+
			2002	Yes	10
			2003	No	0
			2004		
			2005	Yes	5
Contact Person:		Phone #:		GPS:	49.94206 104.20364

Comments: Land owned by Victor Preb. Release was on the west side of the old house, across the drainage ditch, next to the field. The galls have moved to the east, 400 - 599 m. 2001: A good site for spring collection and re-location. 2002: Photo 2002 P11 - 008, 009, 010, 011. Galls on the base of perennial plants. Could not finds any winter rosettes, suspect grasshoppers. 2003: Very few plants. 2004: Not monitored because of water in the drainage ditch. 2005: 2005 P14 - 007, 008, 009, 010. GPS1 WP122.

RM 109	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
NE 36-10-20 W3	22-Aug-01	9				
SK-01-R-033						
Contact Person:	Don Aldag	Phone #:	672-3728	GPS:	49.8695	108.5804 Cal
Comments: Landowner: Don Aldag						

RM 121	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
SW 5-14-32 W1	29-Aug-01	9	2002	No	0	
SK-01-R-016			2003	No	0	
			2005	No	0	
Contact Person:	Marshall McLeod	Phone #:	435-4242	GPS:	50.13804	101.68269
Comments: Landowner: Garnet Fawcett, Moosomin. 2002: Winter annual plant present but no galls. 2005: 2005 P15 - 001, 002, 003. GPS2 WP405.						

RM 121	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
NW 9-14-31 W1	28-Aug-01	9	2002	Yes	10^+	
SK-01-R-025			2003	Yes	10	
			2005	NO	0	
Contact Person:	Marshall McLeod	Phone #:	435-4242	GPS:	50.16873	101.66926
Comments: Landowner: Kenrad Johnson, Moosomin. 2002: Release site. Photo 2002 P11 - 012. Excellent site in a construction equipment storage area, disturbance. 2003: 7 plants with galls and 2 without, damage by galls, good release site. 2003 P3 - 014, 015, 016. 2005: Site destroyed by bull dozer, no sc rosettes, good grass competition. 2005 P15 - 004. GPS2 WP404.						

RM 153	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
SW 16-16-3 W2	12-Jul-99	25	2000	Yes	10+	
SK-99-R-005			2001	Yes	10+	
			2002	No	0	
			2003	No	0	
			2005	Yes	10	
Contact Person:	Cynthia Kitchen	Phone #:	435-2303	GPS:	50.33907	102.36518
Comments: Site was sprayed in the fall of 1999 or spring of 2000 to control scentless chamomile. The gall midge was present on some plants that emerged after Roundup was applied. (phone # 532-4410?). Galls were found at the south end of the scentless chamomile patch. 2002: In July lots of galls. Site was cultivated, a few winter annual plant in the fall, no galls. 2003: Dense vegetation, hard to find galls, photo of scentless chamomile around a telephone pole. 2003 P - 007. 2005: Very good collection site. 2005 P15 - 005, 006, 007. GPS1 WP005.						

RM 153	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls	
SW 15-17-2 W2	20-Aug-01	9				
SK-01-R-034						
Contact Person:	Ernest Briggs	Phone #:	735-2936	GPS:	' 50.4296	102.2005 Cal
Comments: Landowner: Chacachas.						

RM 157	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SW 28-18-14 W2	23-Aug-01	9	2002	Yes	10
SK-01-R-028			2003	Yes	10
			2005	Yes	10

Contact Person: Phone #: GPS: 50.54744 103.87228

Comments: Landowner: Bruce Betteridge 699-2532. Released in a pasture. 2002: Photo 2002 P11 - 025. Good site in a field near meadow brome. 2003: 2003 P1 - 018. 2005: 2005 P14 - 011, 012, 013. GPS1 WP025.

RM 158	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NW 9-19-17 W2	23-Aug-01	8	2003	No	0
SK-01-R-023			2005	No	0

Contact Person: Phone #: GPS: 50.60063 104.31593

Comments: Landowner release in roadside ditch in the NW corner of the quarter section. Very hot, dry when released. Transplants were watered every 7 - 10 days. 2003: Only a few plants by rock pile. 2005: Farmed fields and ROW mowed. GPS2 WP411.

RM 184 Sakimay	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NW 39-19-05 W2	7-Oct-02	12	*****	*****	*****
SK-02-R-043					

Contact Person: D. Domres Phone #: 786-1532 GPS: 50.6903 102.6215 Cal

Comments: Requested by Ken Accoose, 697-283? Landowner: Sakimay Reserve Acquisition. Released at the edge of a small pothole.

RM 184	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 2 19A-5 W2	2-Oct-02	13	*****	*****	*****
SK-02-R-039					

Contact Person: Phone #: GPS: 50.9582 102.581 Cal

Comments: Requested by Bert Septon 696-2974.

RM 185	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 24-21-8 W2	23-Aug-01	9	2002	No	0
SK-01-R-017			2005	No	0

Contact Person: Phone #: GPS: 50.81362 102.98205

Comments: Landowner: RM 185, released on a right-of-way 748-2233. 2002: Plastic bag with scentless chamomile. Photo 2002 P11 - 018. No winter annual plants found. Winter annual plant to the north. 2005:No dead plants and rosettes, good competition and mowing.. 2005 P15 - 008, 009, 010. GPS1 WP026.

RM 185	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 19-20-9 W2	23-Aug-01	9	2002	No	0
SK-01-R-022			2005	No	0

Contact Person: Phone #: GPS: 50.7307 103.23827

Comments: Landowner: Don Gardiner 335-2925. Edge of crop beside farmyard shelterbelt. 2002: No winter annual plants, nearest 60 ft away, with no galls. 2005: Site destroyed, area cultivated. GPS1 WP027

RM 189	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 13-20-21 W2	3-Oct-02	12	*****	*****	*****
SK-02-R-040					

Contact Person: Phone #: GPS: 50.6987 104.776 Cal

Comments: Requested by Allan Floyd, 731-3376. Released 400 m along a trail into a forage stand. 2003: Visited June 8, no evidence of new galls.

RM 217	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 09-23-15 W2	22-Aug-01	9			
SK-01-R-029					

Contact Person: Phone #: GPS: 50.93568 104.03108

Comments: Landowner: Richard and Linda Aspinall 432-4828. All plants have flags beside them. Edge of slough, fairly sheltered and little disturbance in that area. GPS2 WP406.

RM 243 City of Yorkton	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NW 31-25-03 W2	11-May-04	12	2004	No	0
SK-04-R-073			2005	Yes	1

Contact Person: Brian Dudar Phone #: 621-6771 GPS: 51.20548 102.42044

Comments: Landowner: City of Yorkton. 2004: Looked like a good site but no galls on skeleton plants or winter annuals. 2004 P22 - 020, 021. 2005: Competitive vegetation moving in. GPS1 WP188.

RM 243 City of Yorkton	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NW 31-25-03 W2	11-May-04	12	2004	No	0
SK-04-R-074			2005	No	0

Contact Person: Brian Dudar Phone #: 621-6771 GPS: 51.2051 102.42008

Comments: Landowner: City of Yorkton. 2004: Looked like a good site to transplant galled plants but no galls on skeleton or winter annual plants. 2004 P22 - 022. 2005: Very competitive vegetation, no scentless chamomile. 2005 P14 - 022. GPS1 WP193.

RM 244 City of Yorkton	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 04-26-04 W2	11-May-04	12	2004	No	0
SK-04-R-070			2005	No	0

Contact Person: Brian Dudar Phone #: 621-6771 GPS: 51.21147 102.49557

Comments: Landowner: City of Yorkton. 2004: Galled scentless chamomile plants were placed in the bank of the water course. Good competition from weeds. 2004 P22 - 017, 018, 019. 2005: Dense vegetation on bank, mowed by road, lots of rosettes on mowed area. GPS1 WP171.

RM 244 City of Yorkton	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 33-25-04 W2	11-May-04	12	2004	No	0
SK-04-R-071			2005	No	0

Contact Person: Brian Dudar Phone #: 621-6771 GPS: 51.20946 102.49795

Comments: Landowner: City of Yorkton. 2004: Galled scentless chamomile plants were placed in between mounds of soil that were levelled this summer. 2004 P22 - 015, 016. 2005: Soil continually moved by front end loader. 2005 P14 - 021. GPS1 WP175.

RM **244**	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
City of Yorkton					
NE 01-26-04 W2	11-May-04	12	2004	Yes	1
SK-04-R-072			2005	No	0

Contact Person: Brian Dudar Phone #: 621-6771 GPS: 51.22416 102.43294

Comments: Landowner: City of Yorkton. 2004; Site mowed and some plants with galls may have been mowed. 2004 P22 - 023, 024. 2005: Competitive vegetation, road bladed, few rosettes. 2005 P14 - 023. GPS1 WP186.

RM **252**	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 27-26-29 W2	23-Aug-01	9			
SK-01-R-015					

Contact Person: Doug Patience Phone #: 638-4967 GPS: 51.2517 105.9598 Cal

Comments: Landowner: Town of Davidson 567-2040. In storage compound.

RM **276**	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 12-32-13 W2	4-Oct-02	12	2003	Yes	6
SK-02-R-044			2005	Yes	10

Contact Person: Phone #: GPS: 51.73064 103.71089

Comments: Requested by Saskatchewan Highways, Brian Janson, 544-5430. Landowner: Barry (David) Bateman, Calgary AB. Released in a gravel pit that was once used by Saskatchewan Highways and Transportation. 2003: Site photo. 2003 P12 - 022. 2005: Evidence of grasshoppers, lots of galls on dead plants, some galls on rosettes. 2005 P14 - 016, 017, 018, 019. GPS2 WP429.

RM **276**	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NW 34-28-11 W2	22-Aug-01	9			
SK-01-R-019					

Contact Person: Phone #: GPS: 51.4711 103.4806 Cal

Comments: Landowner: Doug and Marian Bonar 272-3334. All plants have wooden stakes beside them. Edge of field and in ditch.

RM **278**	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 04-29-16 W2	*****	14	*****	*****	*****
SK-03-R-054					

Contact Person: G. Kreitzer Phone #: 835-2560 GPS: 51.4785 104.2004 Cal

Comments: Released in an old yard.

RM 320	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 13-32-23 W3		9	2000	Yes	10^{+}
SK-00-R-008			2001	Yes	10^{+}
			2002	No	0
			2003	No	0
			2004	No	0
			2005	No	2

Contact Person: Phone #: GPS: 51.75011 109.11935

Comments: 2000: Galls found in 20 minutes. 2001: Evidence of gall on dead summer annual plants. No rosettes at the release site. The gall midge moved to scentless chamomile plants that were growing on the south bank of a dugout. 2002: No scentless chamomile plants found, grasshopper problem. 2002 P11 - 025. 2003: Water level in dugout was high, flooded last years plants. Photo, site and scentless chamomile nearby. 2003 P4 - 024, 025. 2004: 2004 P13 - 001, 002, 003, 004, 005. 2005: Slough overflowing with water, scentless chamomile galls found near the fence. 2005 P13 - 012, 013. GPS1 WP117.

RM 337	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 28-36-14 W2	8-Oct-03	12	*****	*****	*****
SK-02-R-048					

Contact Person: Phone #: GPS: 52.1174 103.9337 Cal

Comments: Landowner T. Cawiewell. 2003: Released in a right-of-way by a yard site. Site marked. Release remained at bus stop for an unknown number of days.

RM 337	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
*****	*****	*****	*****	*****	*****
SK-02-R-048					

Contact Person: Ed Lablonski Phone #: 383-4046 GPS:

Comments: Landowner Ed Lablonski 383-4046

RM 339	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 36-34-20 W2	15-Oct-02	12	*****	*****	*****
SK-02-R-049					

Contact Person: Phone #: GPS: 51.9647 104.6982 Cal

Comments: landowner: Saskatchewan Wildlife Federation, 692-8812. Released in a shelterbelt. Released 800 ft from east boundary.

RM 339	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 36-34-20 W2	6-Oct-02	12	*****	*****	*****
SK-02-R-038					

Contact Person: Phone #: GPS: 51.9683 104.7041

Comments: Landowner: Saskatchewan Wildlife Federation, 692-8812. Released in a shelterbelt, 300 ft west of 1/4 line (west side).

RM 341	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 28-32-26 W2	6-Oct-02	12	*****	*****	*****
SK-02-R-037					
Contact Person:	Russ Deneiko	Phone #: 259-4927	GPS:	51.7718	105.625 Cal
Comments: Requested by Pat Clavelle RM of Viscount, 944-2044.					

RM 341	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 27-32-25 W2	23-Aug-01	9			
SK-01-R-032					
Contact Person:		Phone #:	GPS:	51.7682	105.4539 Cal
Comments: Landowner:					

RM 341	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SW 16-32-25 W2	23-Aug-01	9			
SK-01-R-020					
Contact Person:		Phone #:	GPS:	51.7427	105.4893 Cal
Comments: Landowner: Ivan Allin 946-2440					

RM 344	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
Saskatoon City	15-May-03	12	2005	Yes	10
SK-03-R-051					
Contact Person:	Garry Bowes	Phone #: 933-7695	GPS:	52.18887	106.66742
Comments: Landowner, Edge Transport, released in a drainage ditch, by an equipment storage area. 2005: 2005 P14 - 014, 015. GPS2 WP407.					

RM 344	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
Saskatoon City	15-May-03	12	2005	No	0
SK-03-R-052					
Contact Person:	Garry Bowes	Phone #: 933-7695	GPS:	52.1892	106.66764
Comments: Landowner, Edge Transport, released north of house used for storage, by an equipment storage area. 2005: Site destroyed, gravelled storage and parking lot. GPS2 WP408.					

RM 344	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
Saskatoon City	15-May-03	12	2005	No	o
SK-03-R-053					
Contact Person:	Garry Bowes	Phone #: 933-7695	GPS:	52.18977	106.6664
Comments: Landowner, Edge Transport, released to the east, in the field behind the storage area. 2005: Site destroyed, gravelled storage and parking lot. GPS2 WP408. GPS2 WP409.					

RM 351	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SW 8-36-24 W3	23-Aug-01	9	2002	No	0
SK-01-R-024			2003	No	0
			2004	No	0

Contact Person:	Estelle Finley	Phone #:	372-4470	GPS:	52.0761	109.3967

Comments: Landowner: Bob Finley 372-4258. Released near a tree belt bordering pasture-crop. 2002: Site in the shelter belt behind the workshop back of the house near the cemetery. Drought, few plants, no galls. 2003: Grasshoppers ate plants in fall. Good late fall and spring rains. 2004: All plants visited in 20 min. GPS1 WP020.

RM 351	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SW 16-36-24 W3	7-Jul-99	16 - 18	2000	Yes	10^+
SK-99-R-001			2001	Yes	10^+
			2002	Yes	10
			2003	Yes	3
			2004	No	0
			2005	No	0

Contact Person:		Phone #:		GPS:	52.08705	109.37956

Comments: 1999: Released near a dugout that was constructed 2 years ago. 2000: Not sure of the release point but galls are present 30 m from the general release area. 2001: No water in dugout/slough. Winter annual plants have galls. Evidence of galls on summer annual scentless chamomile plants. Scentless chamomile plants found in the south west corner of the dugout. 2002: Winter annuals (2), dugout. Photo 2002 P11 - 022, 023, 024. 2003: Plants found on south bank of the dugout. Site, toadflax, gall, gall. 2003 P5 - 001, 002 (toadflax), 003, 004. 2004: 2004 P13 - 011, 012, 013 (site), 014, 015 (toadflax), 016, 017, 018, 019 (bladder campion). 2005: Water depth up 6 ft, problem could be high spring water; lots of winter annuals ; dugout not used, competitive vegetation. GPS1 WP074.

RM 429	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 29-45-20 W2	*****	*****	*****	*****	*****
SK-02-R-047					

Contact Person:	Tom Boyle	Phone #:	878-8807	GPS:	52.9104	104.8592 Cal

Comments: Landowner: Don Spratt, 752-3800. Release site is a grassed water-way shoulder adjacent to a slough.

RM 436	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 21-44-11 W3	30-Aug-01	9			
SK-01-R-031					

Contact Person:	Gordon & Joan Jackson	Phone #:	246-4881	GPS:	52.8013	107.5294 Cal

Comments: Landowner: Gordon & Joan Jackson. Released in a pasture.

RM 456	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 22-48-11 W2	29-Oct-03	5	*****	*****	*****
Lee Release2					

Contact Person:		Phone #:		GPS:	53.1577	103.5174 Cal

Comments: Landowner Brian Brochu, Arborfield, 769-8940. Released in a pasture.

RM 487	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 13-50-15 W2	9-Jun-00	9	2000	Yes	10^+
SK-00-R-007			2001	Yes	10^+
			2002	Yes	10^+

Contact Person: Phone #: GPS: 53.30836 104.05509

Comments: 9 transplanted plants were alive. 2002: Release site, close up (2). Photo 2002 P11 - 005, 006, 007. Gall found between grassland and field. Good site to collect. GPS1 WP170.

RM 487	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 13-50-15 W2	9-Jun-00	6	2000	Yes	10^+
SK-00-R-013			2001	Yes	10^+
			2002	Yes	10^+

Contact Person: Phone #: GPS: 53.3063 104.05276

Comments: On July 20, 2000, 5 transplanted plants alive and 3 died. 2002: Release site, close up (3). Photo 2002 P11 - 001, 002, 003, 004. Difficult to see galls because grasses and forbs are moving in. GPS1 WP050.

RM 488	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NW 10-52-16 W2	28-Oct-03	4	*****	*****	*****
Lee Release1					

Contact Person: Phone #: GPS: 53.4778 104.2795

Comments: Released on a right-of-way.

RM 491	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 17-50-25 W2	15-Jun-00	9	2000	Yes	10
SK-00-R-011			2001	Yes	10^+
			2002	Yes	1
			2005	No	0

Contact Person: Phone #: GPS: 53.3206 105.59962

Comments: Land owner Rod and Linda Sexsmith. 2000: The plants were transplanted by the road and then re-transplante over by the slough. 6 transplanted plants were alive on September 25, 2000. 2002: Very dense stand of rosette, difficult to find those with galls. 2005: Slough full water, scentless chamomile in water, farmed to water and road edge. 2005 P13 - 001, 002, 003, 004. GPS1 WP119.

RM 494	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
NE 9-51-4 W3	16-Jun-99	25	2000	Yes	10^+
SK-99-R-002			2001	Yes	10^+
			2003	Yes	10^+
			2004	Yes	10^+
			2005	Yes	10^+

Contact Person: Phone #: GPS: 53.39448 106.52107

Comments: Released in a quarter section of land which is infested with scentless chamomile. 10 plants were found in 10 minutes. The farmer plans to clean up the scentless chamomile in the corner of the field. 2001: This site was located on the top of a hill. Many scentless chamomile plants were found in micro sites and some have galls. 2004: Two weevils at the site. 2004 P19 - 001, 002, 003, 004. 2005: Very few scentless chamomile rosettes. 2005 P13 - 008, 009, 010, 011. GPS1 WP006.

RM 494	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 34-51-4 W3 SK-00-R-012	13-Jun-00	9	2000	No	0
			2001	Yes	10^{+}
			2002	Yes	10^{+}
			2003	Yes	10^{+}
			2004	Yes	10
			2005	Yes	10
Contact Person:		Phone #:		GPS: 53.44142	106.50067

Comments: Site was sampled on July 6 and August 9, 2000. No galls were found. The scentless chamomile stand was very dense, 0.8 -1 m tall. On the July sample date 9 plants were found alive, whereas none were found alive on the August sample date. Land owner Lawrence Knivlang. Lots of rosettes in the bottom of the gravel pit. 2002: Plants with galls found on the hill and in the gravel pit, 14 collections made in the fall of 2001 and shipped. 2004: Galls on scentless chamomile on the hill. 2004: Site cultivated. 2004 P19 - 008, 009, 010, 011. 2005: 2005 P13 - 005, 006, 007. GPS1 WP173.

RM 494	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SE 34-51-4 W3 SK-	*****	*****	2004	Yes	10
			2005	Yes	10
Contact Person:	*****	Phone #: *****		GPS: 53.44167	106.50018

Comments: In the gravel pit site. 2004: Site mowed. Galled plant but no clusters of galled plants. 2004 P19 - 005. GPS1 WP002.

RM 561	Release Date	No. of Plants Transplanted	Follow-up Year	Insect Present	# Plants with Galls
SW 14-57-21 W3 SK-02-R-045	*****	*****	*****	*****	*****
Contact Person:		Phone #:		GPS: 53.9216	109.0171 Cal

Comments: Landowner: Calvin Morgenstern, 837-4532. Released at the edge of an alfalfa field.

Table 3. List of Release Sites for Scentless Chamomile Stem Weevils

RM 98	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Samples Collected	% Stems Infested
NW 24-11-17 W2						
SK-01-M-004						
Contact Person:		Phone #:		GPS:	49.9306	104.19862
Comments: Released near Lang. GPS2 WP401.						

RM 320	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Samples Collected	% Stems Infested
NE 13-32-23 W3		50		2000	Yes	
SK-00-M-002						
Contact Person:		Phone #:		GPS:	51.75004	109.11931
Comments: 2000: On September 21, sampled 10 shoots; cut and sent to Alec McClay. GPS1 WP118.						

RM 435	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Samples Collected	% Stems Infested
SE 4-45-10 W3				1999	Yes	0
SK-98-M-000						
Contact Person:		Phone #:		GPS:	52.84215	107.41682
Comments: 1999: Plant samples (50 stems) were collected for Alec McClay. GPS2 WP400.						

RM 487	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Samples Collected	% Stems Infested
SE 13-50-15 W2	9-Jun-00	50	20-35	2000	Yes	0
SK-00-M-001						
Contact Person:		Phone #:		GPS:	53.30777	104.0555
Comments: 2000: Plant samples (50 stems) were collected for Alec McClay on September 28, 2000. GPS1 WP054.						

RM 487	Release Date	Release No.	Flowering Stems #/m^2	Follow-up Year	Samples Collected	% Stems Infested
SE 13-50-15 W2	11-Jun-01	60	>35			
SK-01-M-003						
Contact Person:		Phone #:		GPS:	53.30781	104.05552
Comments: Landowner: Dennis Hludraniuk 862-5256. GPS2 WP403.						